SECOND 10-YEAR

PM_{10} MAINTENANCE PLAN

FOR SACRAMENTO COUNTY

AUGUST 2021

**SACRAMENTO METROPOLITAN
AIR QUALITY MANAGEMENT DISTRICT**

SECOND 10-YEAR

PM_{10} MAINTENANCE PLAN

FOR SACRAMENTO COUNTY

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1. Introduction and Background

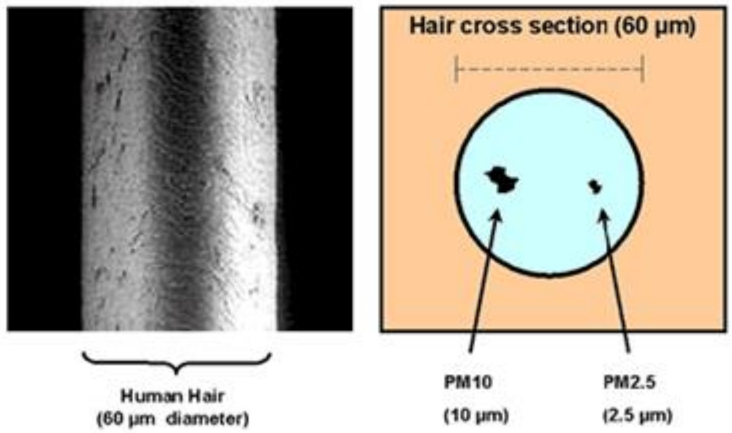
On January 20, 1994, United States Environmental Protection Agency (EPA) classified Sacramento County as a “moderate” nonattainment area for the 24-hour particulate matter of 10 micrometers or less (PM_{10}) National Ambient Air Quality Standards (NAAQS) (58 FR 67334). Sacramento County attained the standard based on PM_{10} air quality monitoring data from 1998 to 2000 (67 FR 7082). To be reclassified as an attainment area, the Clean Air Act (CAA) Section 175A requires attainment and maintenance of the NAAQS for 20 years, demonstrated in two consecutive 10-year maintenance periods. After Sacramento attained the standard, the Sacramento Metropolitan Air Quality Management District (District or Sac Metro Air District) submitted a PM_{10} Implementation/Maintenance Plan and Re-designation Request (Sac Metro Air District, 2010) (referred to as First MP) to EPA. EPA approved the First MP for Sacramento County on September 26, 2013 (78 FR 59261), which became effective on October 28, 2013, and covers the first 10-year maintenance period until 2023.

For the second 10-year maintenance period, the Sac Metro Air District has prepared this Second 10-year PM_{10} Maintenance Plan for Sacramento County (referred to as Second MP) that shows maintenance of the 24-hour PM_{10} NAAQS from 2024 through 2033. This plan includes updated emission inventories, demonstrates maintenance of the PM_{10} standard, provides an updated control measure evaluation, and establishes new motor vehicle emissions budgets (MVEB).

1.1 Background

Particulate matter (PM) is the term for the mixture of solid and liquid particles in the ambient air that we breathe. Some particles are large or dark enough to be seen with the naked eye and can take the form of soot or smoke. The PM_{10} health standard focuses on smaller particles that are likely responsible for adverse health effects because of their ability to reach the lower regions of the respiratory tract. The PM_{10} standard includes particles with a diameter of 10 micrometers or less (one-sixth the width of a human hair – Figure 1-1).

Figure 1-1 Human Hair Diameter



Because particles originate from a variety of activities and processes, their chemical and physical compositions vary widely. Components of PM include nitrates, sulfates, elemental carbon, organic carbon compounds, acid aerosols, trace metals, and geologic materials. PM can be directly emitted to the air or can be produced by secondary formation in the atmosphere when precursor gaseous pollutants, such as nitrogen oxides (NO_X) and sulfur dioxides (SO_2), chemically react with ammonia to form fine particles.

Sources of PM are mainly due to human (anthropogenic) activities, such as residential fuel combustion smoke and soot, entrained road dust, motor vehicle exhaust precursor pollutants, and dust emissions from construction and farming activities. Particles originate from a variety of sources such as mobile (i.e. cars, buses, diesel trucks), stationary (i.e. fireplaces, woodstoves, power plants), and construction demolition, etc. PM can also be generated from natural sources, such as windblown dust and wildfires.

For air quality monitoring purposes, PM is measured and expressed as the mass of particles in micrograms per cubic meter ($\mu g/m^3$) of air. Ambient PM concentrations can build up in the Sacramento region due to its valley geography, stagnant wintertime meteorology, and urban emission sources. PM may eventually be removed from the atmosphere by gravitational settling or deposition, rainout (attaching to water droplets as they fall to the ground), and washout (being absorbed by water molecules in clouds and later falling to the ground with rain).

1.2 Health Impacts

In the EPA's development of the PM_{10} NAAQS, major emphasis was placed upon community epidemiological studies, along with additional toxicological and controlled human exposure studies. These studies have shown that exposure to elevated levels of particulate matter causes adverse human health effects, including reduced lung functions, increased respiratory complications, cardiovascular disease, lowering the body's defense against infections, injury to lung tissue, nonfatal heart attacks, increased risk of cancer and, in extreme cases, premature deaths. People most sensitive to the effects of PM_{10} are those with influenza, asthma and other chronic lung and heart disease, as well as the elderly, young children, and exercising adults.

PM_{10} is likely to penetrate deep into the lung tissue and lodge in the alveoli, the small air sacs in the lung where the essential oxygen transfer occurs. PM_{10} is too small for the natural filtering process of the human body (small hairs and mucous throughout the nasal and lung passage) to remove. Researchers studied health effects from short-term and long-term exposure to particulate matter concentrations in the air. These general findings were reaffirmed when the 1987 PM_{10} 24-hour standard of 150 µg/m^3 was retained after the 1997, 2006, 2012, and 2020 NAAQS review process (see Section 1.4).

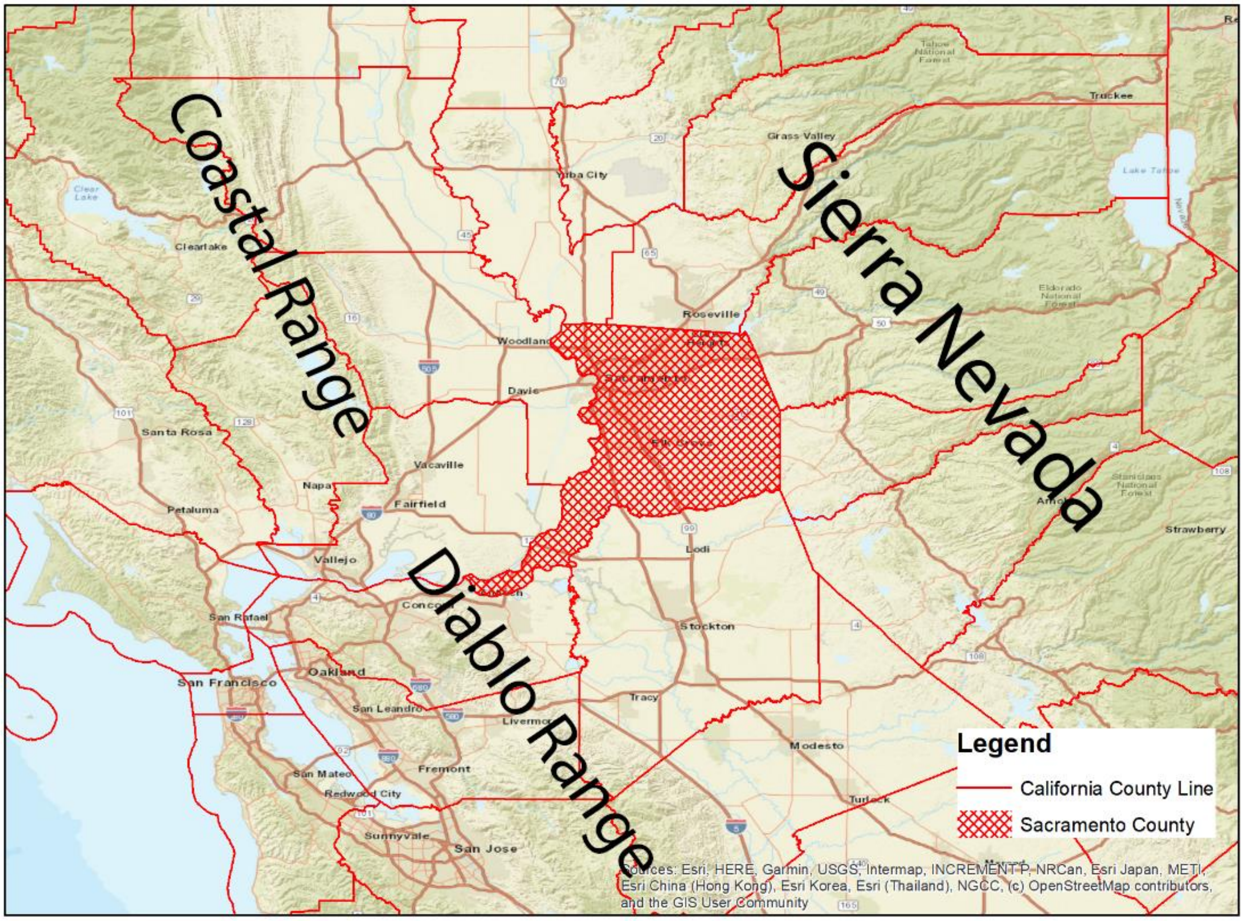
In 2006, after evaluating more recent long-term PM_{10} exposure research studies, EPA concluded that the long-term health impacts were mainly related to exposure to fine-sized particles of 2.5 microns or less in diameter ($PM_{2.5}$) (71 FR 61198). EPA reviewed both the 24-hour and annual PM_{10} standards, and the review did not show an association with long term exposure to particles greater than 2.5 microns (71 FR 61198). Therefore, EPA concluded that because the annual $PM_{2.5}$ standard adequately addressed long-term health impacts an annual PM_{10} standard was no longer needed..

1.3 Description of Sacramento County PM_{10} Nonattainment Area

Physical Geography

The PM_{10} nonattainment area is Sacramento County. Sacramento County encompasses approximately 994 square miles and is located at the southern end of the Sacramento Valley, which is in the northern portion of California's Central Valley (see Figure 1-2). It is bounded by the Coastal and Diablo Ranges on the west and the Sierra Nevada on the east.

Figure 1-2 Location of Sacramento County



The prevailing wind is from the southwest, primarily because of marine breezes through the San Francisco Bay Delta, although during winter, the sea breezes diminish and winds from the north occur more frequently. Between late spring and early fall, a layer of warm air often overlays a layer of cool air from the San Francisco Bay Delta, resulting in an inversion. Typical winter inversions are formed when the sun heats the upper layers of air, trapping below them air that has been cooled by contact with the colder surface of the earth during the night. Calm conditions and poor ventilation allow for increased ambient air pollution concentrations (CARB, 1994).

Sacramento County hosts an array of habitat types, which include annual grasslands and croplands, valley-foothill riparian habitat, valley-foothill woodlands, freshwater emergent wetlands, and riverine habitat. Surface water resources in Sacramento County include the Sacramento, American, Cosumnes, and Mokelumne Rivers which all flow to the Sacramento-San Joaquin Delta.

<u>Population and Economy</u>

Sacramento County has experienced tremendous population growth over the past twenty years. From 1990–2021, the population grew from approximately 1,031,500 to 1,561,014 (California Department of Finance, 2021a; Table E-4). Sacramento County encompasses many different types of land uses and has a well-established and comprehensive transportation system primarily consisting of highways and freeways. Downtown Sacramento has high-rise office buildings and high-density housing, surrounded by suburban development.

The major economic activity in the area is government services and retail trade, along with significant agricultural, industrial, and construction industries (SACOG, 2020). The agricultural lands in Sacramento County are dominated by crop lands in the valley and rangelands in the foothills and produce a wide variety of crops, meat and dairy products.

1.4 PM_{10} Standard

<u>Existing Standard</u>

The primary and secondary[1] NAAQS for PM_{10} are the same,150 microgram per cubic meter (μg/m^3) [2], for the 24-hour average concentration. A violation occurs if the number of 24-hour NAAQS exceedance days per calendar year at a monitoring site is greater than 1.0 averaged over 3 consecutive years. The method used to calculate the standard is specified in 40 CFR 50, Appendix K, Interpretation of the National Ambient Air Quality Standards for Particulate Matter.

<u>History</u>

The milestone dates in the establishment and review of the 24-hour and annual PM_{10} Standards are:

- In July 1987, EPA revised the NAAQS for particulate matter with a new PM_{10} indicator as the basis for the standards (52 FR 24634). The level of the federal PM_{10} standards was set at 150 μg/m^3 for a 24-hour average concentration and 50 μg/m^3 for an annual average concentration.
- In July 1997, EPA retained the existing 24-hour and annual PM_{10} standards (62 FR 38652).

[1] The Clean Air Act of 1990 required EPA to establish Primary standards**,** which provide public health protection, including protecting the health of "sensitive" populations such as asthmatics, children, and the elderly, and Secondary standards, which provide public welfare protection, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings.

[2] When comparing a 24-hour average PM_{10} concentration to the federal standard of 150 μg/m^3, the concentration value is rounded to the nearest 10 μg/m^3. Therefore, the minimum concentration exceeding the 24-hour standard is 155 μg/m^3, which rounds to 160 μg/m^3.

- In September 2006, EPA reaffirmed the 24-hour PM_{10} standard after reviewing the air quality criteria and revoked the annual average PM_{10} standard based on the more recent studies indicating long-term health impacts were mainly related to Particulate Matter of 2.5 micrometers or less ($PM_{2.5}$) exposure (71 FR 61144).
- In December 2012, EPA reaffirmed the 24-hour PM_{10} standard of 150 $\mu g/m^3$ (78 FR 3086).
- On December 18, 2020, EPA retained, without revision, the existing primary and secondary NAAQS for particulate matter ($PM_{2.5}$ and PM_{10}) (85 FR 82684).

1.5 Nonattainment Designation

Upon enactment of the 1990 CAA Amendments, Sacramento County was designated as unclassifiable[3] for PM_{10} pursuant to Section 107(d)(4)(B)(iii) of the CAA. However, during 1989 and 1990, two PM_{10} monitors in Sacramento County (Del Paso Manor and Stockton Boulevard[4]) exceeded and violated the 24-hour PM_{10} standard. On January 20, 1994, EPA took final action to redesignate Sacramento County as a "moderate" nonattainment area for the PM_{10} NAAQS (58 FR 67334) with an attainment deadline of December 31, 2000.

1.6 Attainment and Approval of PM_{10} Redesignation Request and Maintenance Plan (First 10-Year Maintenance Plan)

On March 18, 2002, EPA officially determined that Sacramento County had attained the PM_{10} NAAQS by the attainment deadline based on PM_{10} air quality monitoring data from 1998 to 2000 (67 FR 7082). EPA approved the First MP on September 26, 2013 (78 FR 59261). A maintenance plan must provide maintenance for at least 10 years after the redesignation has been approved by EPA (not 10 years after submittal of a redesignation request). Although the year 2022 was selected as the end of the first 10 years of the First MP, EPA approved the maintenance plan through 2023 (and not 2022) since the action on the First MP did not become effective until October 28, 2013.

In approving the First MP (78 FR 59261), EPA found:

- The MVEB met all the transportation conformity requirements (MVEB were established for 2008, 2012 and 2022 for PM_{10} and NO_X);
- Maintenance demonstrations showed the area will continue to attain the 24-hour PM_{10} NAAQS for at least 10 years beyond the initial redesignation (i.e. through 2023);

[3] An area designation of "unclassifiable" means that there is not enough data to determine an area as attainment or nonattainment for a standard.

[4] Operations at Stockton Boulevard were discontinued in 2014 – see Tables 2-3 and 2-4 for air quality data through 2013.

- The contingency plan that the District would follow in the event of a violation met all applicable requirements for maintenance plans and related contingency provisions in CAA Section 175A; and
- The 2008 emissions inventory served as the attainment year emissions inventory.

EPA also found that the State addressed all the necessary redesignation requirements for Sacramento County to attain the 24-hour PM_{10} NAAQS and that the First MP met all five criteria for redesignation under CAA Section 107(d)(3)(E).

1.7 Requirements for a Second 10-Year Maintenance Plan

CAA Section 175A(b) requires the submittal of a State Implementation Plan (SIP) revision (Second 10-Year Maintenance Plan) that continues to show attainment and maintenance of the NAAQS for an additional 10 years following the first 10-year period. This revision is submitted eight (8) years after the original redesignation request/maintenance plan has been approved. The deadline to submit the Second 10-year PM_{10} Maintenance Plan for Sacramento is October 28, 2021.

The District's Second MP will demonstrate continued attainment and maintenance from 2024 through 2033 for Sacramento County and addresses the CAA requirements specified in Section 175A and EPA Guidance (Calgagni, 1992). The Second MP includes the following:

- A contingency plan to ensure continued maintenance from 2024 through 2033 and prompt correction of any unforeseen violations
- Emission inventories for the base year (2017), first year of the second 10-year maintenance plan (2024), interim year (2027), and last year of the second 10-year maintenance plan (2033)
- Development of Motor Vehicle Emissions Budgets for 2024, 2027 and 2033
- Maintenance demonstration
- Approved monitoring network plan
- Verification of continued attainment

Section 1.9 provides a brief description of each section in the Second MP.

1.8 Second MP Development and Public Review Process

The Sac Metro Air District is the local air quality regulatory agency for Sacramento County. The District prepared the Second MP in collaboration with the Sacramento Area Council of Governments (SACOG) and California Air Resources Board (CARB). SACOG is the Metropolitan Planning Organization (MPO) for the Sacramento region, which includes six counties and over 20 cities. SACOG develops regional transportation and land use development plans and provides a forum for government and public input on regional issues. SACOG provided data used to update the motor vehicle emissions inventory, which was used by CARB to develop the motor vehicle emissions budgets.

SACOG's Regional Planning Partnership is an advisory committee with close to 100 representatives from local, regional, state, federal, and tribal governments, as well as representatives of business, environmental, and minority organizations and associations. This venue, which includes local, regional, state, and federal air quality and government agencies, serves as the interagency consultation process to provide comments on transportation conformity budgets and issues.

The District will hold a 30-day public comment period for the Second MP. The District will post a public notice requesting for comments on the District's webpage with a link to an electronic copy of the Second MP. The District will use the District's email listserv to send the public notice to those that are interested in receiving air quality planning information. At the end of the 30-day public comment period, the District's Board of Directors will hold a public hearing to consider the approval of the Second MP for PM_{10}.

1.9 Overview of Second MP Contents

This document includes the information and analyses to fulfill the federal PM_{10} air quality maintenance planning requirements for the Sacramento County nonattainment area. The following chart contains a brief description of each chapter in the Second MP.

Table 1-2 Chapter Description in this document

Chapter 1	**Introduction and Background:** Provides an introduction that contains background information on PM_{10} air pollution, Sacramento County nonattainment area, Clean Air Act Requirements, purpose and development of the plan.
Chapter 2	**PM_{10} Monitoring Network and Air Quality Data**: Describes Sacramento County's monitoring network and analyzes PM_{10} air quality data and trends.
Chapter 3	**Emissions Inventories**: Provides the PM_{10} and precursor pollutants (NO_X) baseline emissions inventory (2017), maintenance years (2024 and 2033), and interim year (2027) projections; and Emissions Reduction Credits available as of January 1, 2018.
Chapter 4	**Control Measures:** Describes control measure requirements and identifies the appropriate control measures that will provide for maintenance of the PM_{10} NAAQS.
Chapter 5	**Maintenance Demonstration**: Includes the data analysis and provisions for a maintenance demonstration.
Chapter 6	**Contingency Plan**: Discusses contingency plan requirements and maintenance contingency plan.
Chapter 7	**Transportation Conformity**: Describes the transportation conformity requirements and development of the motor vehicle emissions budgets.
Chapter 8	**General Conformity:** Describes the general conformity requirements
Chapter 9	**Summary and Conclusion**: Evaluates the fulfillment of the redesignation requirements.

2. PM_{10} Monitoring Network and Air Quality Data

2.1 PM_{10} Monitoring Network

The District operates a network of particulate matter ($PM_{2.5}$ and PM_{10}) monitors for use in air quality observation and planning. The PM_{10} monitoring network meets the basic objectives of (1) providing timely air quality data to the public, and (2) determining compliance with air quality standards.

The minimum number of monitors for each pollutant is based on the Metropolitan Statistical Area (MSA) population as described in 40 CFR 58 Appendix D. As of January 2021, the Sacramento-Arden Arcade-Roseville MSA, which includes Sacramento County, has a population of 2.38 million (California Department of Finance, 2021a). The monitoring network within the MSA exceeds the minimum monitoring requirements for all criteria pollutants. Based on the MSA population, Sacramento County is required to have two to four PM_{10} monitors, and there are currently four air monitoring sites in Sacramento County (Sac Metro Air District, 2020, Table 3-1) that collect PM_{10} data.

There are two types of PM_{10} monitors used throughout the monitoring network: 1) the Federal Reference Method (FRM) filter-based high-volume size-selective inlet sampler (hi-vols or Size Selective Inlet) and 2) the Federal Equivalent Method (FEM) tapered element oscillating microbalance (TEOM), which measures PM_{10} on a continuous basis. The schedule for PM_{10} sample collection is one in six days for the FRM filter-based high-volume samplers, while the FEM TEOM monitors operate on a daily 24-hour schedule.

For the four PM_{10} monitoring sites in Sacramento County, the Sac Metro Air District operates three sites (North Highlands, Del Paso Manor, and Sacramento Branch Center) and CARB operates one site (Sacramento T Street). At the Del Paso Manor monitoring site, there are two collocated FRM monitors; Sacramento Branch and North Highlands monitoring sites each have an FRM monitor; and Sacramento T Street has a FEM TEOM monitor. Table 2-1 provides a summary of the monitoring stations in Sacramento County with PM_{10} monitors, and Figure 2-1 shows a map of the locations of Sacramento County monitoring stations with $PM_{2.5}$ and PM_{10} monitors. Over the next two years, the District will be evaluating the replacement of the existing FRM PM_{10} monitors with continuous FEM PM_{10} monitors.

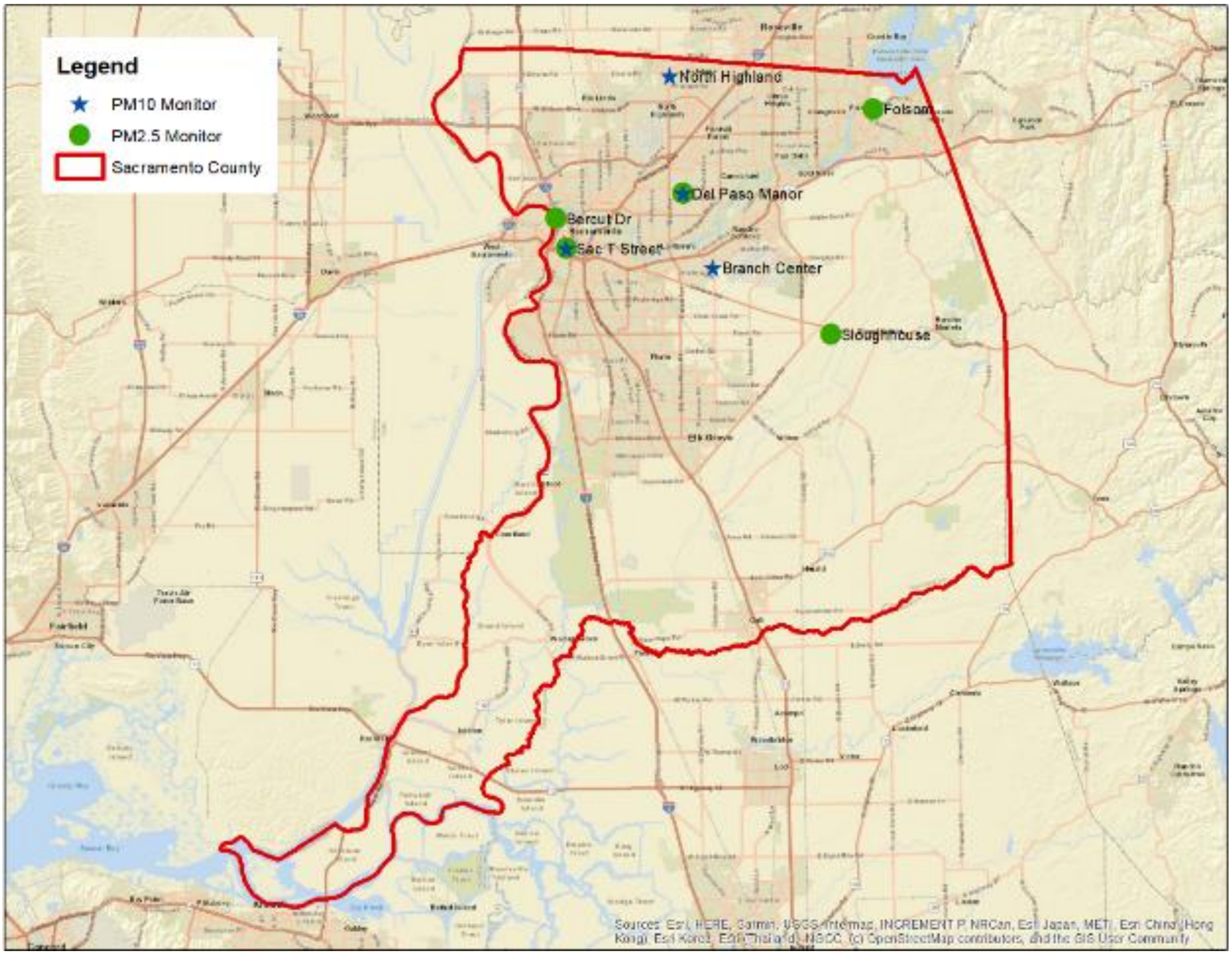
Table 2-1 Summary of Monitoring Sites with PM_{10} Monitors in Sacramento County

AQS ID	Site Name	Purpose	Pollutants/Parameters Monitored
06-067-0284	Branch Center Rd #2 3847 Branch Center Road	SLAMS	PM_{10} (24-hour)
06-067-0006	Del Paso Manor 2701 Avalon Drive	SLAMS/ PAMS/ STN/ SPM	Ozone (O_3), Carbon Monoxide (CO), Nitrogen Dioxide (NO_2), Sulfur Dioxide (SO_2), lead (Pb), PM_{10} (24-hour), $PM_{2.5}$ (hourly and 24-hour), Reactive Nitrogen Compound (NOy), Nonmethane Hydrocarbon (NMHC), Volatile Organic Compound (VOC), Carbonyl, $PM_{2.5}$ (Speciated), Black Carbon (BC) Ambient Temperature, Relative Humidity, Solar and Ultraviolet Radiation, Barometric Pressure, Precipitation, Wind Direction and Speed
06-067-0002	North Highlands 7823 Blackfoot Way	SLAMS/ SPM	O_3, CO, NO_2,, PM_{10} (24-hour)
06-067-0010	T Street 1309 T Street	SLAMS	O_3, NO_2, PM_{10} (hourly), $PM_{2.5}$ (hourly and 24-hour), $PM_{2.5}$ (Speciated), Ambient Temperature, Wind Direction and Speed

Source: Sac Metro Air District, “2020 Annual Air Monitoring Network Plan”.

Note: AQS – Air Quality System
SLAMS – State and Local Monitoring Stations
PAMS – Photochemical Assessment Monitoring Stations
STN – Speciation Trends Network
SPM – Special Purpose Monitor

Figure 2-1 Sacramento County Sites with PM Monitors



2.2 Ambient Air Quality Data

Ambient air quality data for PM_{10} is collected through the air monitoring network described in Section 2.1. Due to the two types of monitors (continuous vs. filter-based), the PM_{10} data is calculated and expressed as 24-hour averages in order to compare the data with each other and against the 24-hour PM_{10} standard. This section discusses the 24-hour average PM_{10} air quality concentrations from the monitoring stations in Sacramento County. Table 2-2 shows the maximum 24-hour average PM_{10} concentrations between 1998 and 2019, and Table 2-3 shows the number of exceedances between 1998 and 2019 for the monitoring sites in Sacramento County.[5]

[5] Tables 2-4 and 2-5 do not include elevated concentrations in 2018 that were due to exceptional events (see Section 2.3)

Table 2-2 PM_{10} Maximum 24-Hour Average Concentrations (µg/m^3) for Sacramento County Monitoring Sites, 1998-2019 (Exceptional Events excluded)

Year	N Highlands	DPM-1	DPM-2	DPM-3	SacT-St-1	SacT-St-2	SacT-St-3	SacT-St-4	AirportRd-1	AirportRd-2	GoldenCt-1	GoldenCt-3	Brach-Ctr-1	Brach-Ctr-2	Hlth-Ctr-2	Hlth-Ctr-3	Peak
	06-067-0002-1	06-067-0006-1	06-067-0006-2	06-067-0006-3	06-067-0010-1	06-067-0010-2	06-067-0010-3	06-067-0010-4	06-067-0013-1	06-067-0013-2	06-067-0014-1	06-067-0014-3	06-067-0283-1	06-067-0284-1	06-067-4001-2	06-067-4001-3	
1998	73	100	104	67	75	65	74		99	93			81		79	61	104
1999	73	139	141	126	99	143	90		53	70			86		88	132	143
2000	82	59	58	67	64	57	62		37	73			56		86	58	86
2001	64	68	66	65	89	73	48		73	51			78		58	122	122
2002	53	86	84	43	77	86			144	73			77		85	103	144
2003	62	53	54	43	65					57			75		53	73	75
2004	44	38	49	101	58				35	47			45		44	91	101
2005	110	71	72	49	53				56				61		64	70	110
2006	65	63	62	132	109				90				38	81	56	159	159
2007	56	70	70	66	53				94					56	56	51	94
2008	97	71	69	92	73				71		56			89	88	92	97
2009	33	45	45	39	47						48			76	45	44	76
2010	48	44	41	25	53						42	55		62	45	50	62
2011	65	62	62		38						63	69		69	60	73	73
2012	34	41	39		36						32	76		60	34	37	76
2013	48	56	55		53			89			51	95		59	47		95
2014	29	40	38					105			33	46		45	39		105
2015	45	40	42					57			53	30		44	41		57
2016	31	31	31					49			33	22		45	34		49
2017	66	57	59					149			23	16		79			149
2018	50	42	43					147						148			148
2019	53	53	53					174						53			174

Note: All active monitoring stations are highlighted in yellow, and all other monitoring stations have been either closed, relocated, or operations discontinued.

Data source: Data was extracted from United States Environmental Protection Agency (EPA) Air Quality Systems (AQS) for PM_{10} monitors on 08/06/2020.

Table 2-3 Number of Exceedance Day for 24-Hour Average PM_{10} Concentrations ($\mu g/m^3$) for Sacramento County Monitoring Sites (Exceptional Events excluded)

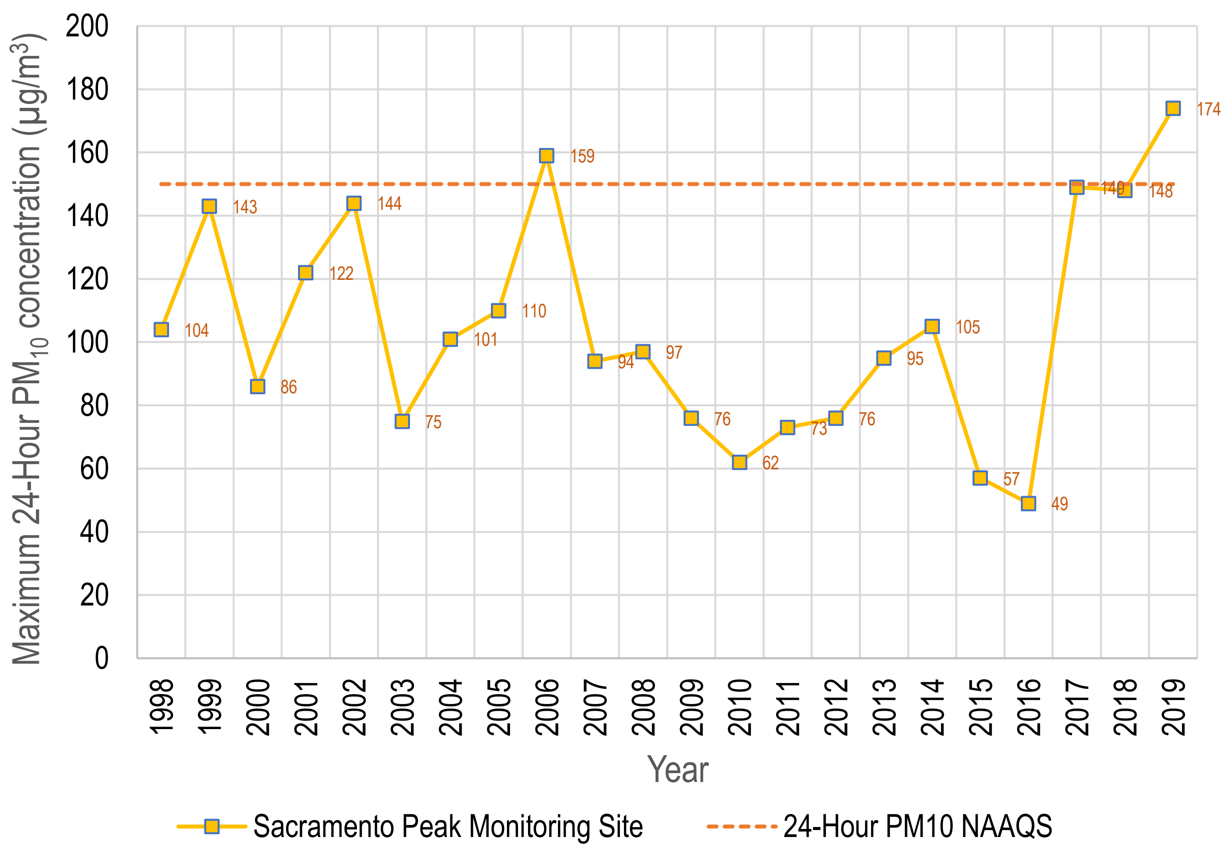
Year	N Highlands	DPM-1	DPM-2	DPM-3	SacT-St-1	SacT-St-2	SacT-St-3	SacT-St-4	AirportRd-1	AirportRd-2	GoldenCt-1	GoldenCt-3	Brach-Ctr-1	Brach-Ctr-2	Hlth-Ctr-2	Hlth-Ctr-3	All Sites in Sacramento County
	06-067-0002-1	06-067-0006-1	06-067-0006-2	06-067-0006-3	06-067-0010-1	06-067-0010-2	06-067-0010-3	06-067-0010-4	06-067-0013-1	06-067-0013-2	06-067-0014-1	06-067-0014-3	06-067-0283-1	06-067-0284-1	06-067-4001-2	06-067-4001-3	
1998	0	0	0	0	0	0	0		0	0			0		0	0	0
1999	0	0	0	0	0	0	0		0	0			0		0	0	0
2000	0	0	0	0	0	0	0		0	0			0		0	0	0
2001	0	0	0	0	0	0	0		0	0			0		0	0	0
2002	0	0	0	0	0	0			0	0			0		0	0	0
2003	0	0	0	0	0					0			0		0	0	0
2004	0	0	0	0	0				0	0			0		0	0	0
2005	0	0	0	0	0				0				0		0	0	0
2006	0	0	0	0	0				0				0	0	0	1	1
2007	0	0	0	0	0				0					0	0	0	0
2008	0	0	0	0	0				0		0			0	0	0	0
2009	0	0	0	0	0						0			0	0	0	0
2010	0	0	0	0	0						0	0		0	0	0	0
2011	0	0	0		0						0	0		0	0	0	0
2012	0	0	0		0						0	0		0	0	0	0
2013	0	0	0		0			0			0	0		0	0		0
2014	0	0	0					0			0	0		0	0		0
2015	0	0	0					0			0	0		0	0		0
2016	0	0	0					0			0	0		0	0		0
2017	0	0	0					0			0	0		0			0
2018	0	0	0					0						0			0
2019	0	0	0					1						0			1

Note: All active monitoring stations are highlighted in yellow and all other monitoring stations have been either closed, relocated, or operations discontinued.

Data source: Data was extracted from EPA AQS for PM_{10} monitors on 08/06/2020.

Figure 2-2 (based on the values in Table 2-2) shows the peak 24-hour PM_{10} concentrations from 1998 to 2019. In 2006, Sacramento county exceeded the 24-hour PM_{10} standard, but the one exceedance was isolated and did not contribute to a violation of the standard. Since 2006, the county has continued to see a decrease in PM_{10} concentrations, which is a result of implemented control measures as discussed in Chapter 4. The Check Before You Burn Program, Rule 421, is responsible for most of these reductions. In 2017, 2018, and 2019, the county recorded peak PM_{10} concentrations near or above the standard of 150 µg/m^3. These peak concentrations, between 2017 and 2019, are discussed in Sections 2.3 and 2.4 and are suspected to be impacted by wildfires and/or high wind dust events.

Figure 2-2 Peak 24-hour PM_{10} Concentrations from 1998 – 2019 (Excluding 2018 Exceptional Events)



Note: The 2006, 2017, 2018, and 2019 peak concentrations are suspected to be impacted by wildfires. The peak concentration in 2018 does not include the concentrations requested to be excluded due to an exceptional event.

2.3 2017-2019 Data Impacted by Natural Events

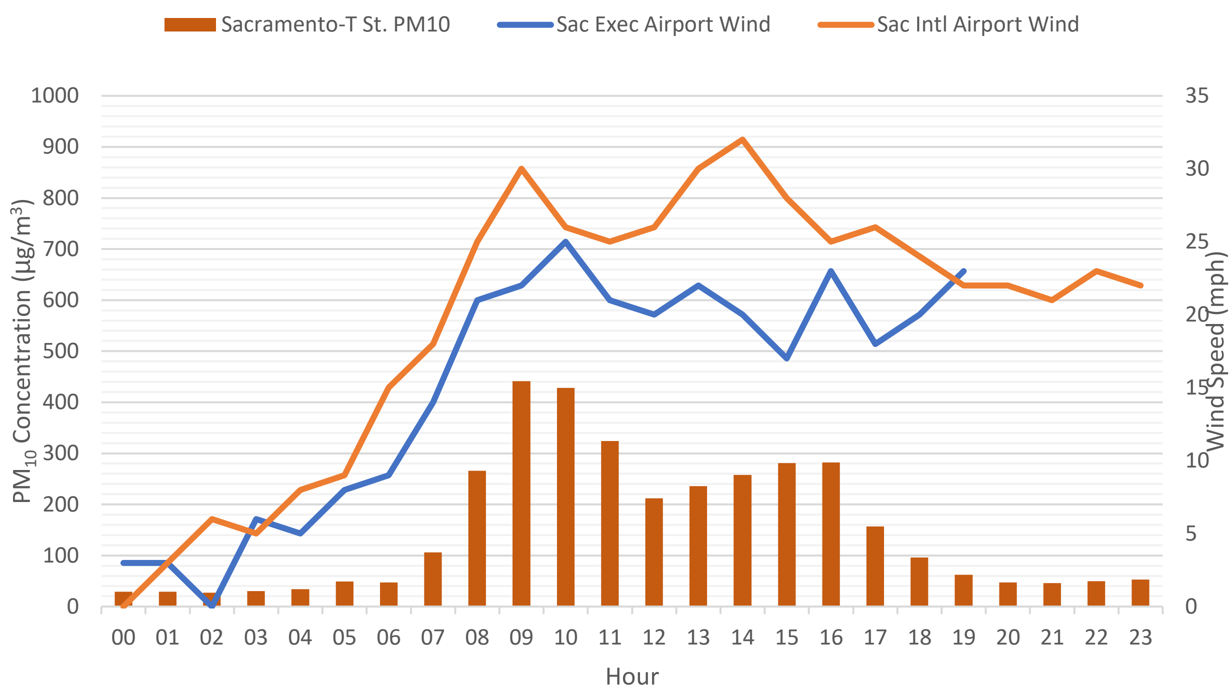
From 2017 to 2019, Sacramento County observed outlier spike concentrations in the peak 24-hour PM_{10} concentrations, which are suspected to be influenced by wildfires and/or high wind dust events. Separate tables are included under the analysis for 2017 (Table 2-4), 2018 (Table 2-5) and 2019 (Table 2-6), which show: 1) dates for all PM_{10} 24-hour values that appear to be influenced by natural events; 2) highest concentration measured at any of the four monitoring stations during that day; and 3) monitoring station and notes regarding what natural event(s) caused or might have caused the high concentrations.

2.3.1 2017 Ambient PM_{10} Concentrations

The peak PM_{10} concentration in 2017 was 149 µg/m^3 on October 8 at the Sacramento T-Street monitoring station. This peak concentration was suspected to be impacted by wildfire smoke and a high wind dust event. California Air Resources Board (CARB) flagged the data for this day with an Informational (IT) flag (stands for "Wildfire-informational only qualifier"), which indicated the data may be impacted by wildfire. On the same day, the meteorology data at the Sacramento Executive Airport showed sustained wind speeds of over 30 mph from the north to northwest (NCDC, 2021)[6]. This high wind event was suspected to have transported dust or smoke into Sacramento county and contributed to high PM_{10} concentration reading. Figure 2.3 shows the hourly PM_{10} concentrations and the hourly wind speeds from Sacramento Executive Airport and Sacramento International Airport. The hourly concentrations between hours 8 and 17 were more than 150 µg/m^3, and these high concentrations were recorded during the high wind speeds.

[6] Historical meteorological data is extracted from National Climatic Data Center's Local Climatological Data (LCD) website. < https://www.ncdc.noaa.gov/cdo-web/datatools/lcd >

Figure 2-3 Hourly PM_{10} Concentrations and Wind Speed on October 8, 2017



The peak concentration in 2017 is suspected to be impacted by natural events and may not represent actual ambient conditions in Sacramento. Although the data may have been affected by wildfire smoke or high wind dust event, the 24-hour PM_{10} concentration did not exceed the standard and does not have any regulatory impacts. The second highest value in 2017 that may better represent the ambient condition was 87 µg/m^3, which was recorded on October 10 at the Sacramento T-Street monitoring station. The following table shows the two highest values for 2017 recorded at any of the four monitoring stations in Sacramento.

Table 2-4 First and Second PM_{10} Max Concentrations in 2017

Date	Highest	Conc (µg/m^3)	Monitoring Station	Notes
10/08/2017	1st	149	T-Street	Likely caused by high winds dust event and/or wildfires
10/10/2017	2nd	87	T-Street	Satellite imagery shows the presence of smoke

2.3.2 2018 Ambient PM_{10} Concentrations

The county experienced many days in 2018 where the PM_{10} concentrations were impacted and elevated by wildfire smoke. These high concentrations were recorded during November 2018 and were impacted by the smoke from the Camp Fire Wildfire

(CAMP). The top six highest PM_{10} concentrations were above the PM_{10} standard and were included in an Exceptional Event Demonstration for November 2018 PM_{10} Exceedances in Sacramento County Due to Wildfires (Sac Metro Air District, 2021), which is discussed in Section 2.4. Table 2-5 shows the top PM_{10} concentrations in 2018. Thirteen days of the highest PM_{10} concentrations occurred on consecutive days from November 8 to 20 in 2018, which was during the same time period of the CAMP.

Table 2-5 Top PM_{10} Average Concentrations in 2018

Date	Highest	Conc (µg/m^3)	Monitoring Station	Notes
11/15/2018	1st	292	T-Street	Requested in the Exceptional Event Demonstration to be excluded from regulatory decision
11/16/2018	2nd	252	T-Street	
11/10/2018	3rd	222	North Highland	
11/12/2018	4th	183	T-Street	
11/14/2018	5th	181	T-Street	
11/11/2018	6th	176	T-Street	
11/13/2018	7th	147	T-Street	Most likely impacted by Camp Fire Wildfire
11/17/2018	8th	145	T-Street	
11/18/2018	9th	134	T-Street	
11/19/2018	10th	130	T-Street	
11/20/2018	11th	108	T-Street	
11/08/2018	12th	94	T-Street	May be impacted due to the start of the Camp Fire Wildfire
11/09/2018	13th	83	T-Street	
05/11/2018	14th	79	T-Street	

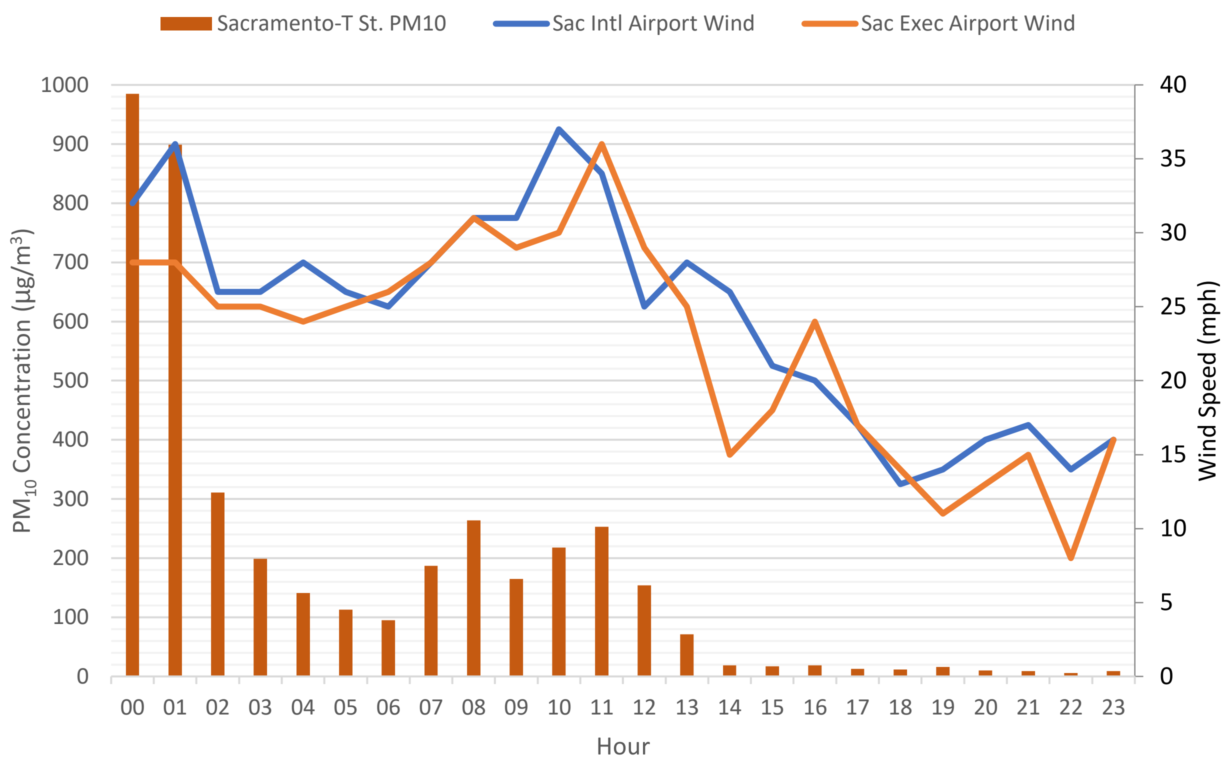
2.3.3 2019 Ambient PM_{10} Concentrations

An exceedance of the PM_{10} standard occurred at the Sacramento T-Street monitoring station on October 27, 2019. The concentration was 174 µg/m^3 and was the peak concentration in 2019. A preliminary review showed it may be caused by wildfire smoke and a high wind dust event. On that day, meteorology data at the Sacramento Executive Airport showed that the wind speeds ranged from 30 to 40 miles per hour (mph), from the north to northwest until about 6 pm (NCDC, 2021)[7] with a peak wind gust of 49 mph. The high PM_{10} concentration occurred when a strong northly wind blew across a dry landscape and entrained dust particles and/or transported smoke from wildfires in Northern California. Figure 2-4 shows the hourly PM_{10} concentrations and the hourly wind

[7] Historical meteorological data is extracted from National Climatic Data Center's Local Climatological Data (LCD) website. < https://www.ncdc.noaa.gov/cdo-web/datatools/lcd >

speeds from Sacramento Executive Airport and Sacramento International Airport. Most hourly concentrations between hours 00 and 12 were more than 150 µg/m^3, and these high concentrations were recorded during the high wind event.

Figure 2-4 Hourly PM_{10} Concentrations and Wind Speed on October 27, 2019



A separate exceptional event demonstration will not be submitted for this exceedance at this time. If this exceedance is determined to have regulatory significance in the future, then a separate analysis will be performed. As such, the peak concentration in 2019 is not representative of ambient PM_{10} conditions due to the natural event influences. The second highest value in 2019 better represents the ambient conditions. This value was 90 µg/m^3 and was recorded on October 9, 2019.

Table 2-6 First and Second PM_{10} Max Concentrations in 2019

Date	Highest	Conc (µg/m^3)	Monitoring Station	Notes
10/27/2019	1st	174	T-Street	Exceedance was probably a result of smoke from a wildfire and high wind dust event
10/9/2019	2nd	90	T-Street	

2.4 2019 Design Value

To determine if the county continues to attain the standard, the District used the data from calendar years 2017 to 2019 to calculate the 2019 design value. For the 24-hour PM_{10} standard, a design value is determined based on the number of exceedance days per calendar year (days with PM_{10} concentrations greater than 150 µg/m^3) averaged over 3 consecutive years at a monitoring site. If the design value is greater than 1.0, then an area has violated the standard and can no longer show attainment or maintenance of the standard. As shown in Tables 2-5 and 2-6, the county experienced six exceedance days in 2018 and one exceedance day in 2019. As a result, the 2019 design value for PM_{10} was greater than 1.0 averaged over three consecutive year, 2017-2019, and the county violated the 24-hour PM_{10} National Ambient Air Quality Standard (NAAQS).

As noted in Tables 2-5 and 2-6, these exceedance days were impacted by uncontrollable wildfire smoke and/or high wind dust events. Wildfires and high wind dust events are also referred to as “exceptional events” when these events and their resulting emissions impact the air quality data and has regulatory significance. EPA has established a mechanism through the “Treatment of Data Influenced by Exceptional Events” Rule (40 CFR § 50.14) that allows the air quality data to be excluded from a regulatory decision if the data was impacted by an exceptional event.

To demonstrate maintenance of the PM_{10} standard, the District needed to exclude the exceedances that occurred in November 2018 because of the CAMP. The District developed an Exceptional Event (EE) Demonstration (Sac Metro Air District, 2021) to request concurrence from EPA to exclude all 2018 exceedance days from regulatory determinations. The EE Demonstration showed that smoke from CAMP resulted in exceedances of the 24-hour PM_{10} NAAQS of 150 µg/m^3 on November 10, 11, 12, 14, 15, and 16 in 2018, which led to a violation of the standard in Sacramento County. Table 2-7 shows the date of exceedances, monitoring location of the exceedances, and the exceedance concentrations. The District completed a 30-day public comment period on the Exceptional Event Demonstration and received no public comments. The Exceptional Event Demonstration was submitted to CARB on March 31, 2021 for review and transmittal to EPA for its concurrence.

Table 2-7 Monitoring Date Exceedances (2018)

At Date of Event	Site Name	Exceedance Concentration (with units)
11/10/2018	Sacramento T Street	189 $\mu g/m^3$
11/10/2018	North Highlands	222 $\mu g/m^3$
11/10/2018	Del Paso Manor (Audit Monitor)	202 $\mu g/m^3$
11/10/2018	Del Paso Manor (Primary Monitor)	212 $\mu g/m^3$
11/10/2018	Sacramento – Branch Center	200 $\mu g/m^3$
11/11/2018	Sacramento T Street	176 $\mu g/m^3$
11/12/2018	Sacramento T Street	183 $\mu g/m^3$
11/14/2018	Sacramento T Street	181 $\mu g/m^3$
11/15/2018	Sacramento T Street	292 $\mu g/m^3$
11/16/2018	Sacramento T Street	252 $\mu g/m^3$
11/16/2018	North Highlands	163 $\mu g/m^3$
11/16/2018	Del Paso Manor (Primary Monitor)	166 $\mu g/m^3$
11/16/2018	Del Paso Manor (Audit Monitor)	163 $\mu g/m^3$

The exceedance that occurred on October 27, 2019 was a result of a different event (likely caused by dust from high winds and/or smoke from a wildfire) and is not included as part of the Exceptional Event Demonstration for the 2018 exceedance days. Table 2-8 shows the number of PM_{10} exceedances in the county between 2015 through 2019.

Table 2-8 Number of PM_{10} Exceedances (24-hour concentrations greater than 150 µg/m^3)

	2015	2016	2017	2018	2019	Sampling Frequency
Sacramento T Street	0	0	0	6	1	Every 24 hours
North Highlands	0	0	0	12	0	1 in 6 days**
Del Paso Manor (Primary Monitor)*	0	0	0	12	0	1 in 6 days**
Del Paso Manor (Secondary Monitor)*	0	0	0	12	0	1 in 6 days**
Sacramento Branch Center	0	0	0	6	0	1 in 6 days**

Notes: * Del Paso Manor has co-located monitors (primary and secondary), so although there were four exceedances, the exceedances occurred on two (not four) days, on 11/10/18 and 11/16/18, at both monitors.

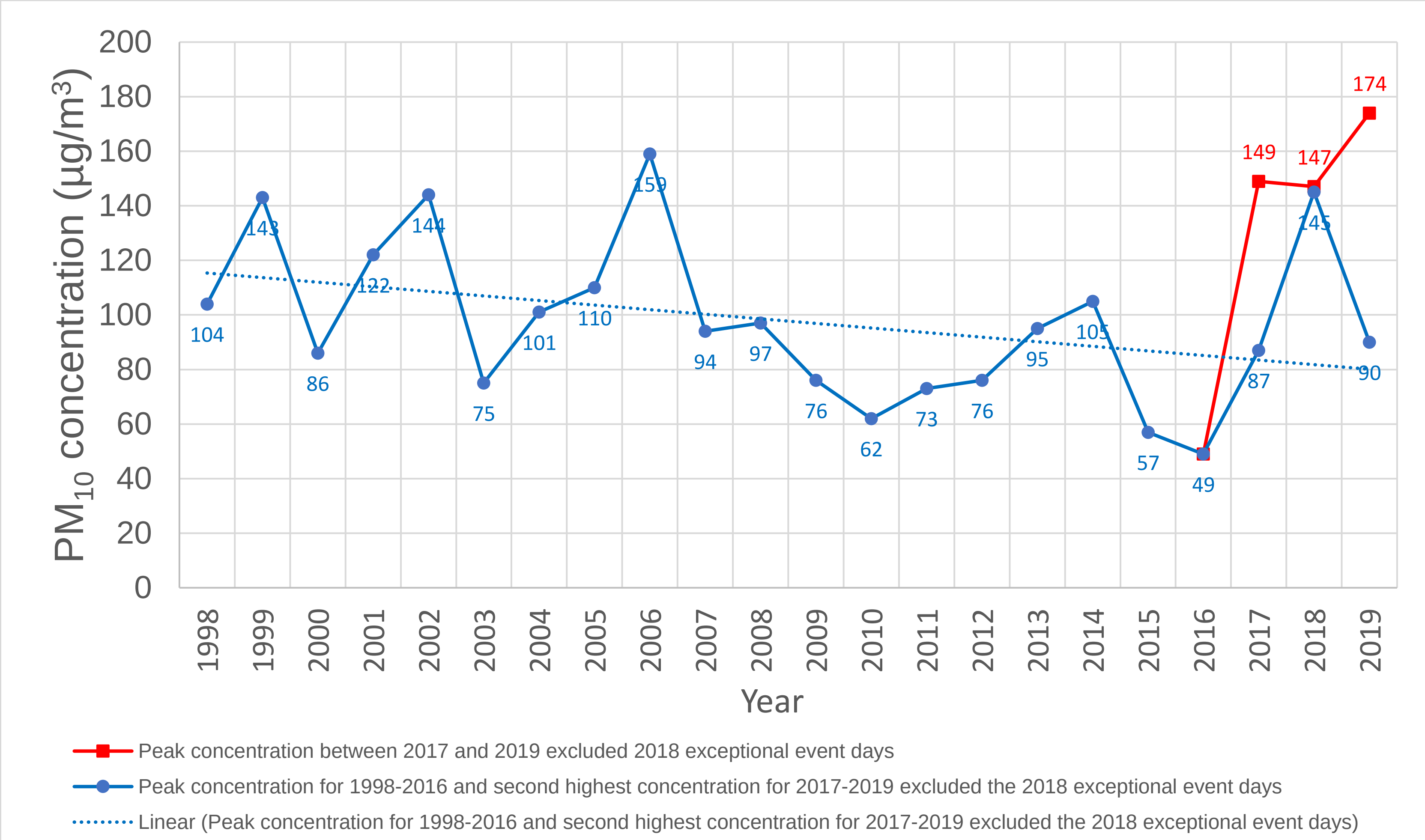
** For monitors where sampling is done 1 in 6 days, each exceedance counts as 6 occurrences.

EPA's concurrence of the Exceptional Event Demonstration will allow exclusion of all exceedances days in 2018, leaving one exceedance (on October 27, 2019) over the three-year period, 2017 – 2019. As a result of exclusion of this exceptional event data, the three-year average for the 2019 design value would be less than 1.0, which means the county continues to show attainment and maintenance of the PM_{10} standard.

2.5 Air Quality Trend Analysis

In the First 10-year PM_{10} Maintenance Plan (First MP), the air quality trend analysis predicted the peak 24-hour PM_{10} concentrations to be 104 µg/m^3 in 2012 and 99 µg/m^3 in 2022. The air quality trend analysis was updated with current data to reflect the peak 24-hour PM_{10} concentrations for each year from 1998 through 2019 (Figure 2-5). The trendline, shown as a dotted blue line, was determined based on the peak PM_{10} concentrations for each respective year, except for the concentrations in 2017, 2018 and 2019 where the second highest concentrations were used (solid blue line). The peak concentrations in 2017, 2018 and 2019, which are shown with the solid red line, were suspected to be impacted by wildfires and/or high wind dust events (see Section 2.3), and those peak values were not used in the air quality trend analysis. For the purpose of this analysis, the second highest concentration after excluding the 2018 exceedance days (or 8th highest concentration in 2018 shown in Table 2-5) was 145 µg/m^3. Even though 2018 was an outlier year, the trendline shows that the PM_{10} concentrations will continue a downward trend, which shows that Sacramento County is expected to remain in attainment in the future. This trendline reflects future values of less than 100 µg/m^3, which is consistent with the projected trendline in the First MP.

Figure 2-5 Sacramento County Peak PM_{10} 24-Hour Concentrations Trendline



Note: The red line shows the peak concentrations for 2017 and 2019, and 2018 highest concentration with the petitioned exceptional event days are already excluded.

The blue line shows the peak concentrations between 1998 and 2016. The 2017, 2018, and 2019 data points are the second highest concentrations because the highest concentrations are suspected to be influenced by an uncontrollable natural event.

Evaluation of 2020 Ambient PM_{10} Concentrations

The District evaluated the 2020 air quality data for PM_{10} to determine if Sacramento would remain in attainment of the PM_{10} standard. Although data from 2020 showed that the 24-hour PM_{10} concentrations on several days exceeded the PM_{10} standard of 150 µg/m^3, these exceedances were the result of smoke impact from wildfires. The exceedances occurred on September 8, 11, 12, and 13 in 2020. Satellite imagery on September 8, 11, 12, and 13 in 2020 showed (See Appendix A) the locations of the active wildfires at the time and where the wildfire smoke had transported to in Sacramento County. On all four of these days, the exceedances were recorded at T-Street monitoring station. On one day, September 12, 2020, the exceedances also occurred at Branch Center, Del Paso Manor, and North Highlands monitoring stations, where the samplings are completed on a 1 in 6 days schedule. The 2020 data also showed that PM_{10} concentrations at the T-Street monitoring station increased abruptly from 66 µg/m^3 on September 7, 2020 to 298 µg/m^3 on September 8, 2020. On September 8, 2020, CalFires and National Interagency Fire Center indicated that the following nearby wildfires were active at the time of the exceedances in Sacramento County:

- Slater/Devils Fire in Northern California (Siskiyou and Del Norte Counties) and Southern Oregon (Josephine County) started September 7 and extinguished on November 16. This wildfire burned 166,000 acres;
- August Complex Fire (include Doe Fire)[8] in Mendocino, Humboldt, Trinity, Tehama, Glenn, Lake and Colusa counties started on August 16 and extinguished on November 11. This wildfire burned more than 1 million acres;
- Red Salmon Complex Fire[9] in Humboldt, Trinity and Siskiyou counties started on July 27 and extinguished on November 17. This wildfire burned 144,698 acres;
- The North Complex Fire[10] in Plumas County started on August 17 and extinguished on December 3. This wildfire burned 319,935 acres;
- The Creek Fire[11] in Fresno and Madera counties started on September 4 and extinguished on December 24. This wildfire burned 379.895 acres;
- The Fork Fire[12] in El Dorado County, started on Sept. 8 and was not fully contained until November 9. The wildfires burned 1,673 acres.

Appendix A provides a detailed assessment of the wildfire smoke impacts in Sacramento on September 8, 11, 12, and 13 in 2020.

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8 August Complex (include Doe Fire), < https://inciweb.nwcg.gov/incident/6983/ >
9 Red Salmon Complex Fire, < https://inciweb.nwcg.gov/incident/6891/ >
10 North Complex Fire, < https://inciweb.nwcg.gov/incident/6997/ >
11 Creek Fire, < https://inciweb.nwcg.gov/incident/7147/ >
12 Fork Fire, < https://inciweb.nwcg.gov/incident/7147/ >

2.6 PM_{10} Seasonality Analysis

A PM_{10} seasonality analysis was conducted to evaluate whether the potential for high PM_{10} concentrations was a year-round problem or a seasonal occurrence in Sacramento County. Meteorological factors can vary during the year and play an important role in their effect on PM_{10} levels. The factors are described below.

Wind. Wind speed and direction are important, because they are indicative of the level of pollutant dispersion. Historical data from National Climate Data Center (NCDC, 2021) at the Sacramento Executive Airport showed that the predominant winds were from the south and southwest during the spring, summer and fall. In the winter month (November through February), predominant winds came from the northwest and southeast direction. Wind speeds averaged around 7 miles per hour (mph) during the spring and summer for the last two decades. Typically, during the late fall and winter, air flows experienced a significant decrease in speed leading to calm conditions. The light winds and calm conditions may result in higher air pollution potential, because pollutants can accumulate in the area for several days before being dispersed. Wind velocities averaged approximately 4.0 mph for the month of November and 4.9 mph for the month of December.

Precipitation. Twenty-year (2000-2019) precipitation records at Sacramento Executive Airport (WRCC, 2021) showed that Sacramento averaged approximately 18 inches of precipitation per year, with 89 percent of the annual precipitation falling between November and April. The months from November through March averaged slightly less than 3 inches of precipitation per month, while the summer months of June through August averaged less than a tenth of an inch of precipitation per month. As expected, fugitive dust levels were greater in hot, dry months when little atmospheric moisture was present to control fugitive dust, although studies suggested that low temperatures in the presence of increased humidity are conducive to the formation of secondary particles (Motallebi, 1999, p.7). While elevated PM_{10} levels have occasionally occurred when no measurable precipitation was present, elevated levels have occurred with increased humidity.

Atmospheric Stability and Dispersion. Vertical air movement is important in the dispersion of air pollutants. A temperature inversion acts as a nearly impenetrable lid to the vertical mixing of the atmosphere and inhibits the dilution of pollution near the ground. Inversions occur with great frequency throughout the year in the Sacramento Valley, and when they are accompanied by low wind speeds in the winter, pollution concentration levels can escalate.

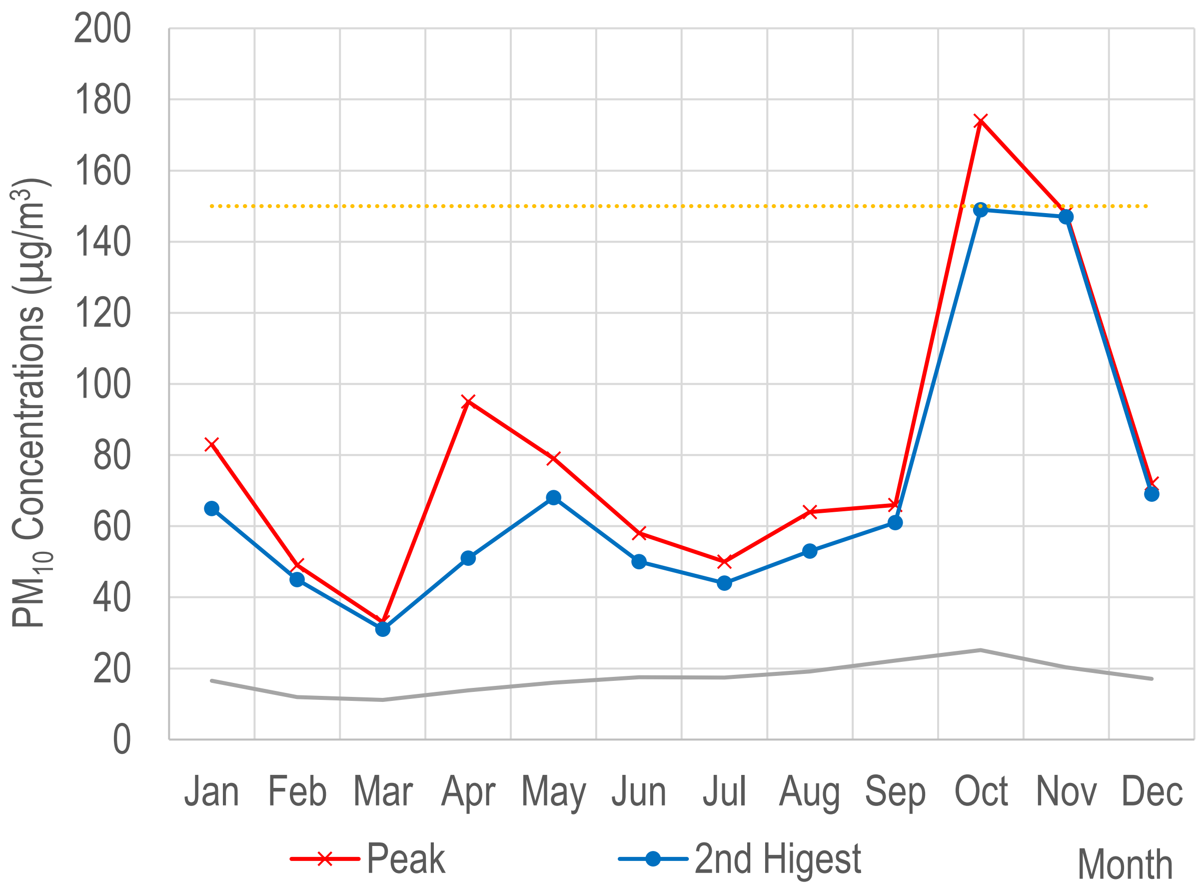
Temperature. The twenty-year (2000-2019) temperature records at Sacramento Executive Airport (NCDC, 2021) showed that Sacramento temperatures reached a high of 111 degrees Fahrenheit during summer and a low of 21 degrees Fahrenheit during winter. Low temperatures in the presence of increased humidity are conducive to the formation of secondary particulates. In addition, as winter temperatures drop, more residents are likely to utilize wood combustion devices, such as fireplaces and woodstoves for residential heating, increasing PM_{10} levels. Since November 2007, the District has implemented an episodic wood combustion curtailment program (Rule 421) on forecasted poor air quality days. Rule 421 has been shown to lower particulate matter ambient concentration during those poor air quality days[13] (Sac Metro Air District, 2009).

<u>PM_{10} Air Quality Data.</u>

Figure 2-6 illustrates the monthly variation in average and peak PM_{10} concentrations monitored in Sacramento County for 2010-2019. The exceedance days during the 2018 Camp Fire Wildfire are excluded from the graph. Elevated concentrations generally occur in the fall and winter, with the lowest concentrations during spring. The peaks shown in April may occur due to high winds combined with agricultural burning and agricultural tilling activities. Peaks during October and November may be a result of wildfires such as the Camp Fire Wildfire in November 2018. Peaks during winter months typically occur from increased secondary formation of particulates and more residential wood combustion.

[13] "Report on Rule 421 – Mandatory Episodic Curtailment of Wood and Other Solid Fuel Burning Effectiveness," Sac Metro Air District staff report package for May 28, 2009 Board of Directors meeting.

Figure 2-6 Monthly Average and Peak (First and Second High) 24-Hour PM_{10} Concentration Values for Sacramento County, 2010-2019 (2018 Exceptional Event Days excluded)



2.7 Future Monitoring Network

The Sac Metro Air District and CARB will continue to operate an appropriate air quality monitoring network, in accordance with 40 CFR Part 58, to verify the attainment status of the area (Calcagni, 1992). This maintenance plan contains provisions for continued operation of air quality monitors that will provide such verification. The Sac Metro Air District documents any changes of its monitoring network in its annual network plan that is submitted and approved annually by the EPA.

The Sac Metro Air District will assure the on-going quality of the measured data by performing the operational procedures for data collection, including routine calibrations, pre-run and post-run test procedures, and routine service checks. An annual review of the entire air quality monitoring network will be done as required by federal regulations as a mean to determine if the network is effectively meeting the objectives of the monitoring program. If relocation or a closure is recommended in the annual network review, reports will be submitted to EPA and CARB to document compliance with siting criteria. The data collection procedures already in place, in conjunction with the annual review program, will ensure that the future PM_{10} ambient monitoring network in Sacramento County meets or exceeds the minimum monitoring requirements and that ambient PM_{10} concentrations are monitored appropriately to verify the attainment status of the area.

2.8 PM_{10} Air Quality Data Conclusions

Ambient air quality data for PM_{10} is currently collected at four PM_{10} monitoring sites in Sacramento County. The Sac Metro Air District operates three sites (North Highlands, Del Paso Manor, and Sacramento Branch Center) and the CARB operates one site (Sacramento T Street). Air quality data from these sites showed that Sacramento County continued to remain below the 24-hour PM_{10} standard of 150 µg/m^3, except when the data in 2018 and 2019 was impacted by wildfire smoke and/or high winds. In November 2018, PM_{10} concentrations for six days exceeded the 24-hour PM_{10} NAAQS. Those exceedance concentrations were attributed to the Camp Fire Wildfire and led to a violation of the PM_{10} standard. To exclude the exceedances from 2018 from regulatory decisions, the District developed and submitted an exceptional event demonstration. If EPA concurs with the exceptional event demonstration, the design value based on data from 2017 to 2019 is below 1.0, which means that the area will continue to attain the standard.

In addition, the air quality trend analysis was updated to reflect the most current data from 1998 to 2019. The trendline shows a downward trend toward less than 100 µg/m^3, and it supports a finding that Sacramento will remain in attainment in the future. The District and CARB will continue to operate an appropriate air quality monitoring network, in accordance with 40 CFR Part 58, to verify the attainment status of the area.

A PM_{10} seasonality analysis was conducted to evaluate whether the potential for high PM_{10} was a year-round problem or a seasonal occurrence in Sacramento County. Elevated concentrations during 1998-2019 usually occurred in fall and winter, with the lowest concentrations during spring.

3. Emissions Inventory

3.1 Introduction to Emissions Inventory

An emissions inventory is an account of pollutant emissions from many sources in an area. It is impractical to directly measure and compile emissions from a multitude of sources on a continuous basis, so surveys and sampling are used to increase understanding. Several methods are used to determine an average emission rate under a variety of conditions, such as: 1) actual emission measurements taken on a subset of devices to determine an average emission rate; 2) source tests at stationary emission sources to provide a snapshot of emission rates that are then applied over time; and 3) field measurements of emissions taken at area sources (such as construction sites) to better determine actual emission rates.

Emission factors, representative values that relate the quantity of emitted pollutants to an associated activity, may be developed by using the methods mentioned above, and are used to determine the total emissions. These factors are multiplied by activity and control factors to estimate emissions from sources.

The emissions inventory used in the Second Maintenance Plan (MP) are from California Air Resource Board's (CARB's) California Emissions Projection Analysis Model (CEPAM): CEPAM 2019: External Adjustment Reporting Tool - Version 1.02 (CARB, 2021). This emissions inventory used 2017 as the base year.

A detailed breakdown of emissions in Sacramento County for PM_{10} and Nitrogen Oxides (NO_X) in 2017, 2024, 2027 and 2033 are presented in the emissions inventory tables provided in Appendix B – Emissions Inventory. Nitrogen oxide emissions were included in the emissions inventory analysis and the maintenance demonstration (Chapter 5) because they were found to be a significant contributor to PM_{10} concentrations in the county.

3.2 Emissions Inventory Requirements

Emissions are updated as part of the overall requirement for "plan revisions to include a comprehensive, accurate, current inventory of actual emissions from all sources of the relevant pollutants" under Clean Air Act (CAA) Sections 172(c)(3) and 182(a)(1).

3.3 Precursors to PM_{10}

The Second MP includes an emissions inventory for total primary PM_{10} emissions and PM_{10} precursor emissions from NO_X. Results of the Chemical Mass Balance (CMB) analysis presented in the First Maintenance Plan[14] showed that PM_{10} and NO_X emissions are the major contributors (see Section 5.1) to the ambient PM_{10} concentrations in Sacramento. Other precursors, such as Sulfur Oxides (SO_X,) contribute a small percentage (about 4%) to the overall emissions (Sac Metro Air District, 2010). Emissions inventory data for SO_X for 2017, 2024, 2027, and 2033 is about 1 ton per day (tpd); as a result, evaluation of the SO_X emission inventory is not included. Volatile organic compounds (VOCs) were also not identified as contributing to the PM_{10} concentrations and therefore, are not included.

Emissions Inventory Source Categories

The anthropogenic (man-made) emissions inventory is divided into four broad categories: stationary sources, area-wide sources, on-road mobile sources, and other mobile sources. Each of these major categories is subdivided into more descriptive subcategory sources, which contain the specific emission processes used to determine the emissions.

3.3.1 Stationary Sources

The stationary source category of the emissions inventory includes non-mobile, fixed sources of air pollution. They are mainly comprised of individual, industrial, manufacturing, and commercial facilities called “point sources.” The more descriptive subcategories include fuel combustion (e.g. electric utilities), waste disposal (e.g. landfills), petroleum production and marketing, and industrial processes (e.g. mineral). Industrial facility operators reported the process and emissions data used to calculate emissions from point sources.

3.3.2 Area-Wide Sources

The area-wide source inventory category includes aggregated emissions data from processes that are individually small and widespread or not well-defined point sources. The area-wide subcategories include residential fuel combustion, farming operations, construction and demolition activities, and road dust. Emissions from these sources are calculated from fuel usage, product sales, population, employment data, and other parameters for a wide range of activities that generate air pollution across Sacramento County.

3.3.3 On-Road Motor Vehicles

The on-road motor vehicles inventory category consists of trucks, automobiles, buses, and motorcycles. EMFAC (Emissions FACtor), the California model for on-road motor

[14] Source contributions used in the CMB study were based on a technical paper on wintertime $PM_{2.5}$ and PM_{10} source apportionment for Sacramento (Motallebi, 1999). The CMB study calculated source contributions for ambient air quality samples (> 40 µg/m^3) collected from November to January for 1991 – 1996.

vehicle emissions, has undergone significant revisions and updates. On-road motor vehicle emission estimates for the Second MP used the most recent approved update, EMFAC2017, which was approved by United States Environmental Protection Agency (EPA) on August 15, 2019 (84 FR 41717).[15]

CARB will apply adjustment factors to the conformity budgets to reflect the impact of the Safe Affordable Fuel Efficient (SAFE) Vehicle Rule Part One rule as described by CARB in a memorandum dated November 20, 2019, titled EMFAC Off-Model Adjustment Factors to Account for the SAFE Vehicle Rule Part One (CARB, 2019). These adjustment factors do not represent updates or changes to the model itself.

3.3.4 Other Mobile Sources

The emission inventory category for other mobile sources includes aircraft, trains, boats, and off-road vehicles and equipment used for construction, farming, commercial, industrial, and recreational activities. Off-road sources were estimated using category specific models for cargo handling equipment, pleasure craft and recreational vehicles, in-use off-road equipment, locomotives, transport refrigeration units, and fuel storage and handling. For all other remaining categories, OFFROAD2007 was used for estimating emissions.

3.4 Base Year Emissions and Forecasts

The base year emissions reflect the most accurate emissions based on surveys and information from that year. The base year emissions are forecasted into the future based on the most current growth and control data available at the time to determine future emissions. For the Second MP, the base year is 2017, and emissions forecasts were done for 2024, 2027, and 2033 because these years are used to determine if the county will remain in attainment.

3.4.1 Anthropogenic Emissions Tables by Source Category

In Sacramento County, high ambient concentrations of 24-hour PM_{10} usually occurred between November and February with a few exceptions during events such as wildfires, high winds, or July 4th or July 5th due to fireworks. The high ambient PM_{10} concentrations are typically due to increased secondary formation of particulates and more residential wood combustion activities, in conjunction with wintertime weather conditions conducive to PM_{10} pollutant build up (e.g., atmospheric stability, low wind dispersion, and colder temperatures).

Tables 3-1 and 3-2 show the anthropogenic emissions inventory for Sacramento County for PM_{10} and NO_X by source categories for an average winter day (November through

15 EMFAC2017 must be used for regional emissions analysis for transportation conformity purposes that are started on or after August 16, 2021.

April) in units of tons per day (tpd). Inventories were generated for the years 2017 (base year), 2024 (first year of the second maintenance period), 2027 (an interim year) and 2033 (the end of the second maintenance period).[16]

[16] Inventories are for Sacramento County from CARB's CEPAM (with external Adjustment), Version 1.02 (CARB, 2021), using the Sacramento Nonattainment Area Tool on April 1, 2021.

Table 3-1 PM_{10} Emissions (tons per average winter day) Sacramento County

AVERAGE WINTER DAY INVENTORY	2017	2024	2027	2033
TOTAL EMISSIONS	**33.58**	**33.78**	**35.15**	**36.43**
STATIONARY	1.42	1.44	1.58	1.62
AREAWIDE	29.39	29.86	31.05	32.26
ON-ROAD MOTOR VEHICLES	2.24	2.08	2.15	2.22
OTHER MOBILE	0.53	0.40	0.37	0.33
STATIONARY				
Fuel Combustion	0.26	0.24	0.25	0.24
Waste Disposal	0.02	0.02	0.02	0.02
Industrial Processes	1.14	1.18	1.31	1.35
AREAWIDE				
Residential Fuel Combustion	9.15	8.97	8.89	8.83
Farming Operations	1.25	1.16	1.12	1.06
Construction and Demolition	9.42	9.57	10.60	11.29
Paved Road Dust	7.69	8.25	8.52	9.15
Unpaved Road Dust	0.65	0.62	0.61	0.59
Managed Burning and Disposal	0.16	0.17	0.17	0.16
Cooking	0.88	0.94	0.96	1.00
Fires	0.06	0.07	0.07	0.07
Fugitive Windblown Dust	0.11	0.11	0.10	0.10
Asphalt Paving/Roofing	0.01	0.01	0.01	0.01
ON-ROAD MOTOR VEHICLES	2.24	2.08	2.15	2.22
OTHER MOBILE				
Aircraft	0.07	0.08	0.08	0.08
Trains	0.02	0.02	0.02	0.02
Equipment (Off-Road/Farm)	0.29	0.20	0.17	0.15
Recreational Boat	0.13	0.09	0.08	0.07
Commercial Harbor Craft	0.01	0.01	0.01	0.01
Off-Road Recreational Vehicles	< 0.01	< 0.01	< 0.01	< 0.01

Table 3-2 NO_X Emissions (tons per average winter day) Sacramento County

AVERAGE WINTER DAY INVENTORY	2017	2024	2027	2033
TOTAL EMISSIONS	**35.84**	**23.57**	**21.96**	**20.08**
STATIONARY	2.24	2.11	2.15	2.17
AREAWIDE	3.90	3.82	3.83	3.87
ON-ROAD MOTOR VEHICLES	21.45	10.66	9.33	7.46
OTHER MOBILE	8.25	6.98	6.65	6.57
STATIONARY				
Fuel Combustion	1.93	1.78	1.80	1.80
Waste Disposal	0.07	0.07	0.08	0.08
Industrial Processes	0.24	0.25	0.27	0.28
Petroleum Production and Marketing	< 0.01	< 0.01	< 0.01	< 0.01
AREAWIDE				
Residential Fuel Combustion	3.83	3.75	3.76	3.81
Managed Burning and Disposal	0.06	0.06	0.06	0.05
Fires	0.01	0.01	0.01	0.01
ON-ROAD MOTOR VEHICLES	21.45	10.66	9.33	7.46
OTHER MOBILE				
Aircraft	1.75	1.98	2.08	2.30
Trains	0.85	0.99	1.02	1.05
Equipment (Off-Road/Farm)	5.00	3.42	2.97	2.69
Recreational Boat	0.39	0.36	0.35	0.34
Commercial Harbor Craft	0.25	0.23	0.22	0.19
Off-Road Recreational Vehicles	0.01	0.01	0.01	0.01

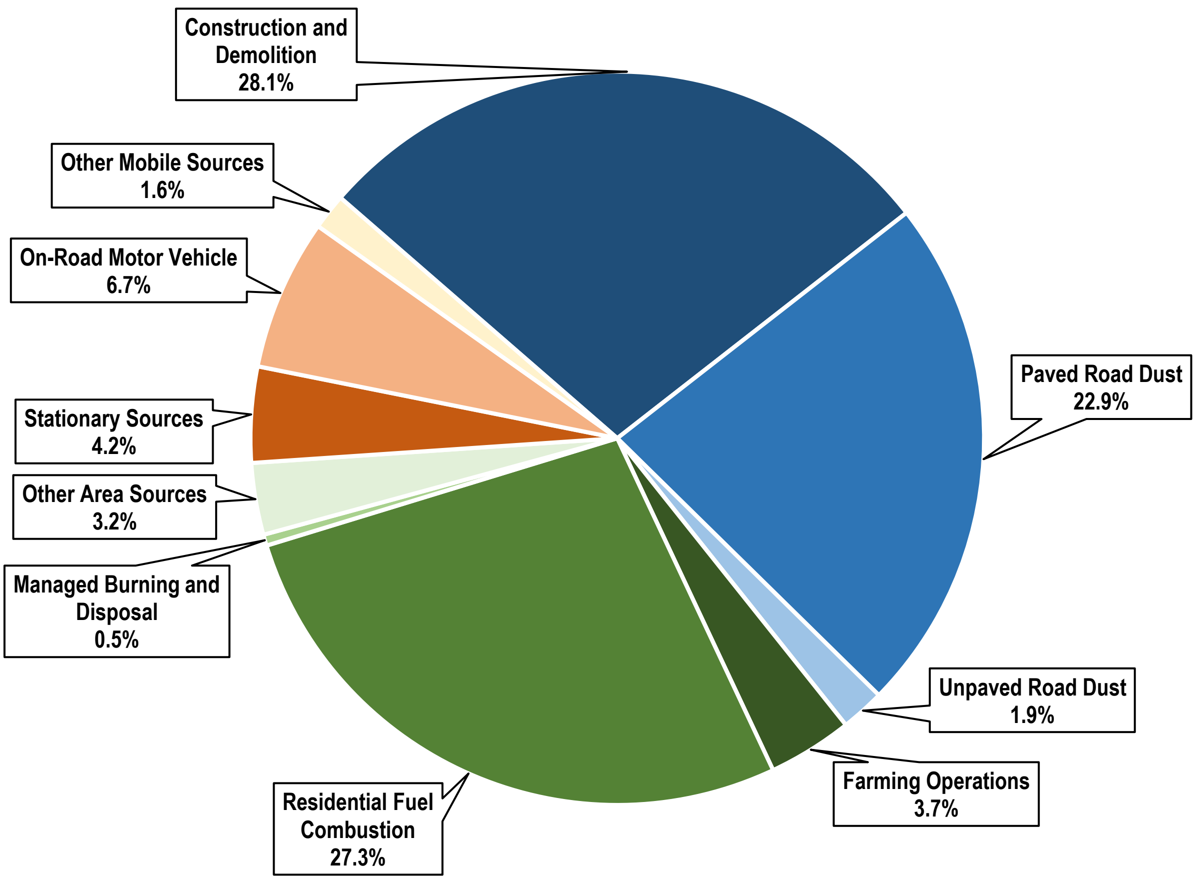
Source: CEPAM 2019: External Adjustment Reporting Tool - Version 1.02 Emission Projections by Summary Category Base Year: 2017. Web. 1 April 2021. < https://www.arb.ca.gov/app/emsinv/2019ozsip/fcmasterdetail_sip2019.php >

3.4.2 Base Year (2017) Emissions Distribution

The following pie chart (Figure 3-1) shows the base year PM_{10} emission inventory categories as a percentage of the total inventory for Sacramento County. In 2017 (as well as 2024. 2027, and 2033), the PM_{10} inventory was mainly comprised of areawide sources (see Table 3-1).

Figure 3-1 Base Year (2017) PM_{10} Emissions Distribution - Sacramento County

33.58 Tons Per Day (average winter day)

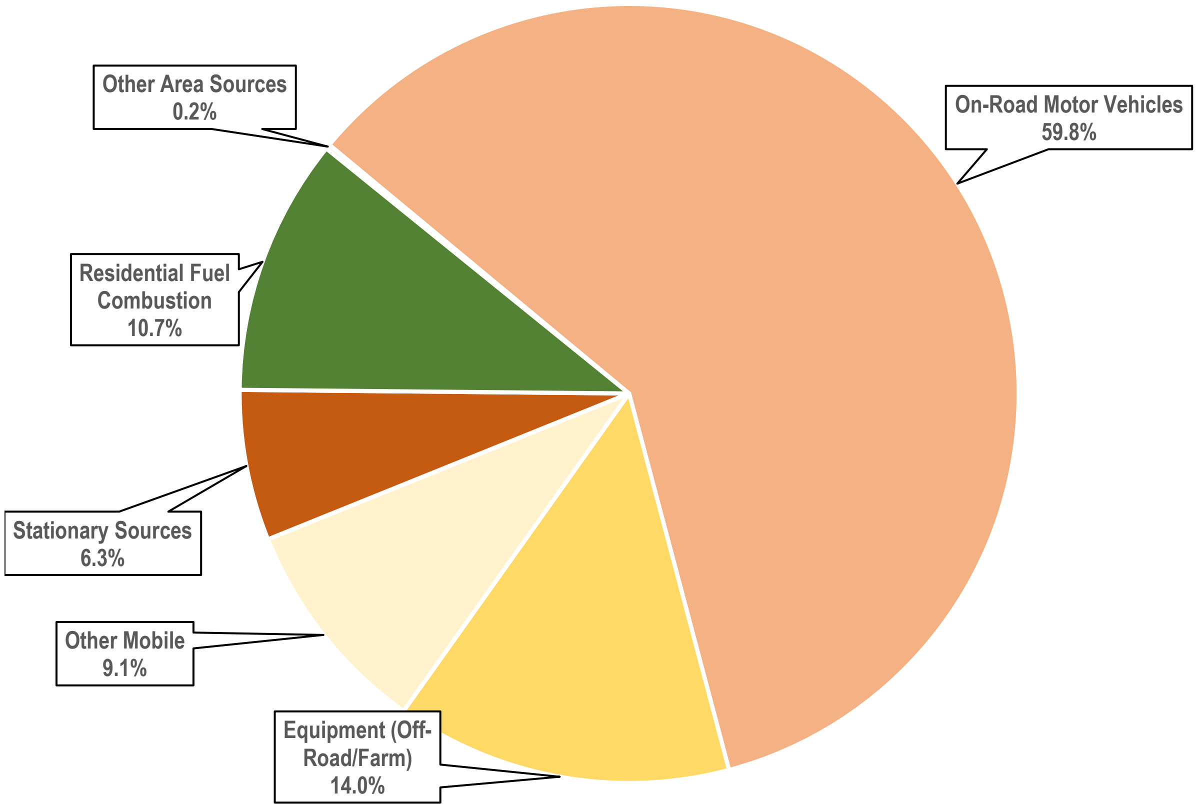


Data Source: CEPAM 2019: External Adjustment Reporting Tool - Version 1.02 Emission Projections by Summary Category Base Year: 2017. Web. 1 April 2021. < https://www.arb.ca.gov/app/emsinv/2019ozsip/fcmasterdetail_sip2019.php >

The main contribution of NO_X emissions comes from on-road motor vehicles and other mobile sources. In 2017, on-road motor vehicles accounted for about 60% of the NO_X inventory, and other mobile sources contributed around 23%.

Figure 3-2 Base Year (2017) NO_X Emissions Distribution - Sacramento County

35.84 Tons Per Day (average winter day)

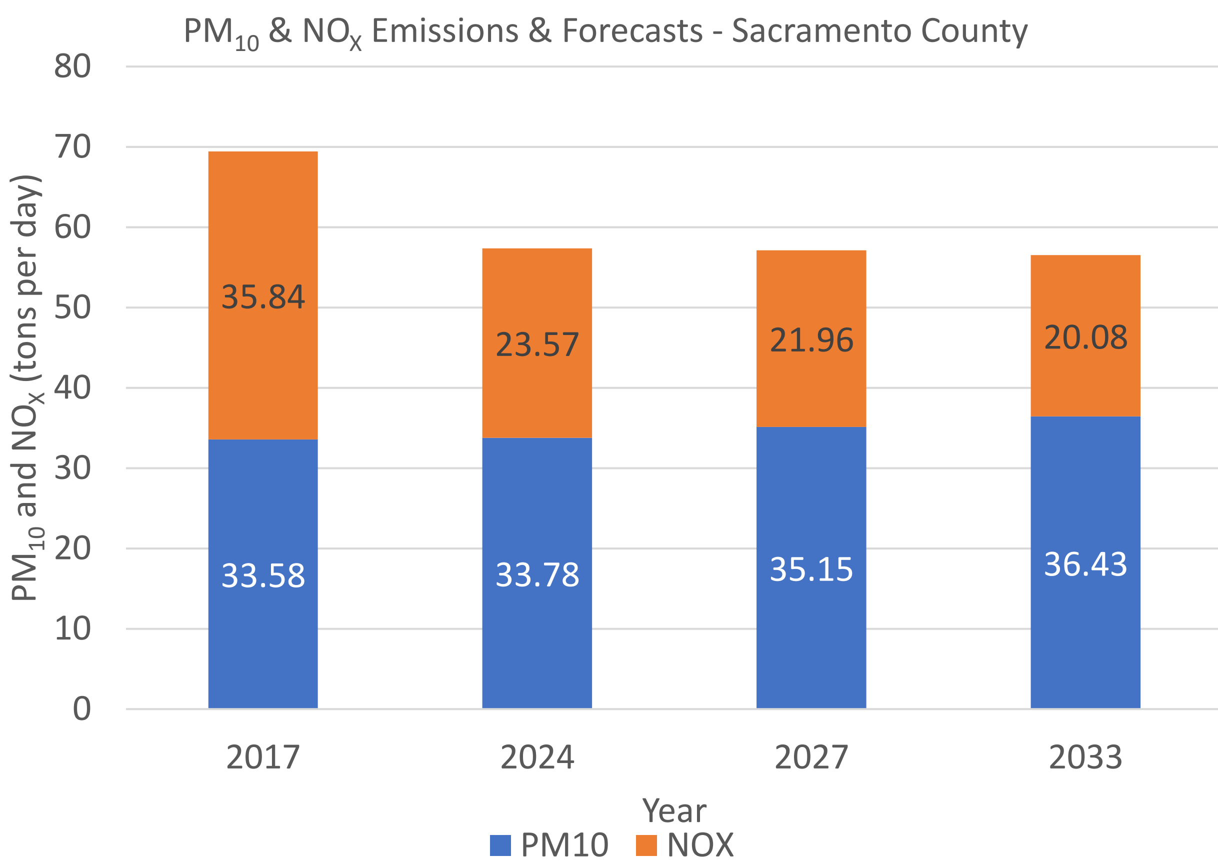


Data Source: CEPAM 2019: External Adjustment Reporting Tool - Version 1.02 Emission Projections by Summary Category Base Year: 2017. Web. 1 April 2021. < https://www.arb.ca.gov/app/emsinv/2019ozsip/fcmasterdetail_sip2019.php >

3.4.3 Analysis of Emissions Inventory Forecasts

Figure 3-3 shows that between 2017 and 2033, combined values of PM_{10} and NO_X emissions are expected to decrease by about 17% from 69 tons per day to 57 tons per day. The reductions are from a decrease in NO_X emissions. PM_{10} emissions are projected to slightly increase from 2017 through 2033. The trends of PM_{10} and NO_X emissions are shown below to help understand how the changes in the emission inventory contributes to the change in PM_{10} concentrations in the future. Also, see Chapter 5 for more information.

Figure 3-3 PM_{10} & NO_X Emissions and Forecasts - Sacramento County



Data Source: CEPAM 2019: External Adjustment Reporting Tool - Version 1.02 Emission Projections by Summary Category Base Year: 2017. Web. 1 April 2021. < https://www.arb.ca.gov/app/emsinv/2019ozsip/fcmasterdetail_sip2019.php >

PM_{10} Emission Trends

The total of the three largest categories of primary PM_{10} emissions (paved road dust, residential fuel combustion, and construction & demolition) make up 78% of total PM_{10} emissions in 2017 and 2033. Table 3-3 shows that between 2017 and 2033:

- Paved road dust is forecasted to increase by approximately 1.5 tpd or 19 %. This increase is caused by an increase in population and vehicle miles traveled (VMT), which probably resulted in an increase in the length of roads and highways in the county (referred to as centerline miles) (SACOG, 2020). Paved road dust is not measured directly and is based on CARB's Miscellaneous Process Methodology (CARB, 2018), which computes paved road dust using the emission factor equation provided by EPA's AP-42 document (EPA, 2011). This document closely correlates airborne emissions with vehicle weight and silt loading. Data from

CARB, air district's and transportation planning agencies were used to estimate county specific VMTs.

- Residential fuel combustion is forecasted to decrease by approximately 0.3 tpd or 3.5 %. The largest categories in Residential Fuel Combustion are woodstoves and fireplaces, which comprises over 90% of the emissions. According to CARB's Residential Wood Combustion Methodology (CARB, 2015), the methodology was updated to reflect more recent survey data, emission factors, and calculation approaches. A decrease in emissions is the result of the implementation of local residential wood burning control measures (see Chapter 4).
- Construction and demolition emissions are expected to increase by 1.9 tpd or 19.8%.

Table 3-3 Emissions from Major Source Categories of PM_{10} for 2017 and 2033

PM_{10} Inventory Category	**Paved Road Dust**		**Residential Fuel Combustion**		**Construction & Demolition**	
PM_{10} Tons Per Day	2017	2033	2017	2033	2017	2033
	7.69	9.15	9.15	8.83	9.42	11.29
Percent Change	19.0%		-3.5%		19.8%	

<u>NO_X Emission Trends</u> The total of the three largest categories (residential fuel combustion, on-road motor vehicles, and off-road and farm equipment) of NO_X emissions represent 84% in 2017 and 70% in 2033. Table 3-4 shows that between 2017 and 2033, two of the three largest sub-categories are expected to decrease, and the third category will have minimal changes.

The largest category of NO_X emissions, on-road motor vehicles, is expected to decrease by about 65% from 21.45 tons per day to 7.46 tons per day. The decrease in on-road motor vehicles is due to implementation of federal, state and local regulations, including fleet turnover.

Table 3-4 Emissions from Major Sources Category of NO_X for 2017 and 2033

NO_X Inventory Category	**Residential Fuel Combustion**		**On Road Motor Vehicles**		**Equipment (Off-Road/Farm)**	
NO_X Tons Per Day	2017	2033	2017	2033	2017	2033
	3.83	3.81	21.45	7.46	5.00	2.69
Percent Change	-0.6 %		- 65.2%		-46.3%	

Table 3-5 shows that total overall NO_X emissions are projected to decrease by about 44% and total PM_{10} emissions are expected to increase by about 8.5% between 2017 and

2033. The NO_x reductions are despite an expected increase in population and vehicle miles traveled (VMT), which also would have driven the PM_{10} emissions higher over this period in the absence of federal, state and local regulations.

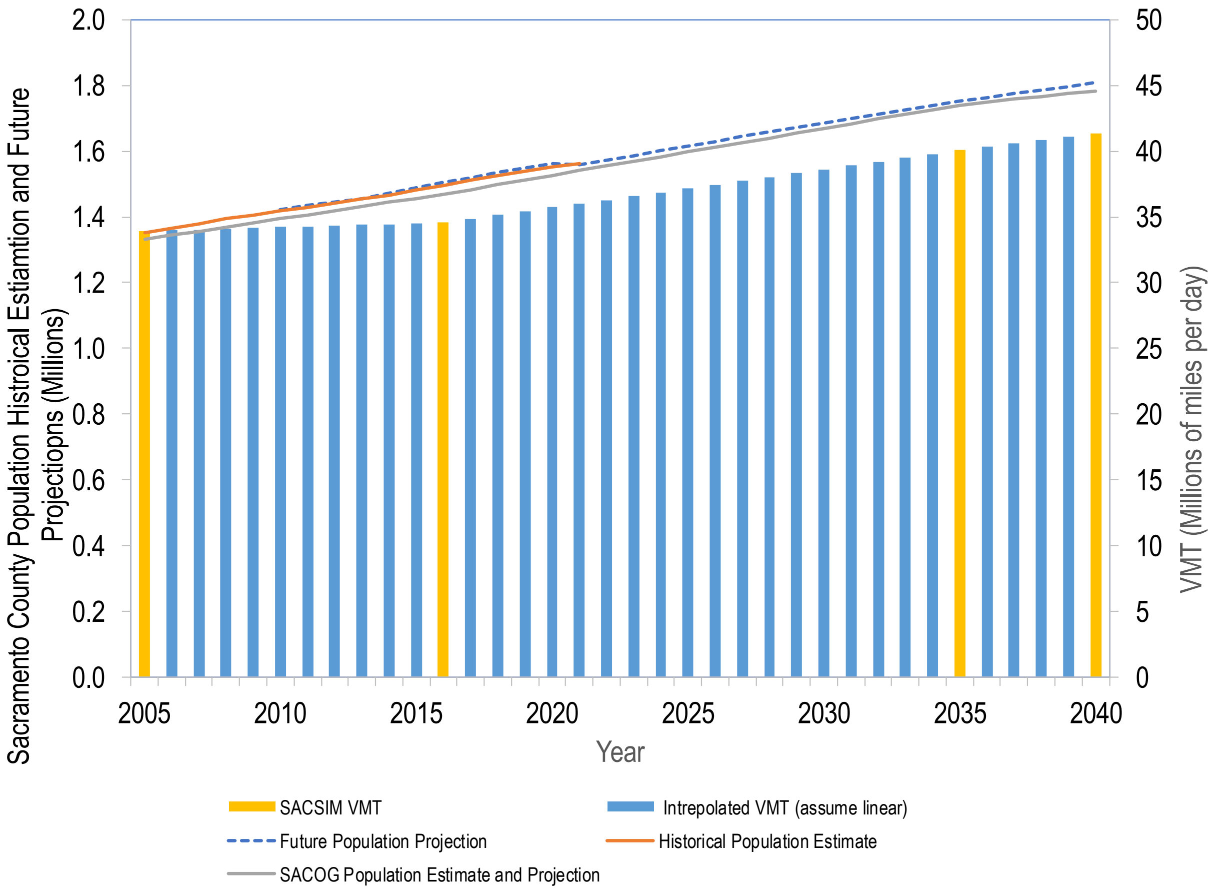
Table 3-5 Total Emissions (PM_{10} and NO_X) for 2017 and 2033

Emissions	**PM_{10}**		**NO_X**	
Tons Per Day	2017	2033	2017	2033
	33.58	36.43	35.84	20.08
Percent Increase	8.5%		-44.0%	

Vehicle Miles Traveled and Population

VMT and population are used as indicators to determine emissions in the future. Figure 3-4 shows that population and VMT have and are expected to continue to steadily increase. Between 2017 and 2033, population is expected to increase about 14% and VMT is expected to increase about 13% in Sacramento County. Although population and VMT are expected to increase, improvements due to fuel economy changes and advancements in clean air technologies are expected to cause an overall decrease in emissions (PM_{10} and NO_X) in the future.

Figure 3-4 Population and VMT Forecasts Sacramento County (2005-2040)



Data sources:

1. Population is obtained from California Department of Finance. Historical Estimation is extracted from Table E-4 (http://www.dof.ca.gov/Forecasting/Demographics/Estimates/ on 08/16/2021) and Future Projection is extracted from Table P-2A (https://www.dof.ca.gov/Forecasting/Demographics/Projections/documents/P2A_County_Total.xlsx on 08/16/2021).
2. Sacramento Area Council of Governments (SACOG) Population Estimate and Projection are obtained from (SACOG, 2020).
3. VMT data are based on Sacramento Activity-Based Travel Simulation Model "SACSIM" regional travel demand model forecasts for SACOG's 2020 MTP/SCS and provided by SACOG (SACOG, 2020).
4. Yearly values not given in either SACOG report are interpolated.

3.5 Emission Reduction Credits

Certain pollutant emission reductions such as those due to equipment shutdown or voluntarily-installed controls may be converted to emission reduction credits (ERCs) and registered with the Sac Metro Air District. These ERCs may then be used as "offsets" to compensate for an increase in emissions from a new or modified emission source that triggers the emissions offset requirement specified in District Rule 202, New Source Review or Rule 214, Federal New Source Review. In the Sac Metro Air District, ERCs may also be used as an alternative to complying with specific prohibitory rules as outlined in Rule 107, Alternative Compliance. Rule 107 provides the procedure to allow a permitted source that cannot meet the applicable emission standard requirements, usually because it is technically infeasible or not cost effective at the time, to lease or purchase ERCs to achieve the required reductions.

Since ERCs represent potential emissions, they are considered in the emission inventories. To accomplish this, one method is to assume that the use of ERCs will already be included within the projected rate of stationary source growth in the emissions inventory. However, if the use of available ERCs exceeds anticipated emissions growth, future emissions could be underestimated. Therefore, to ensure that the use of ERCs is consistent with the future PM_{10} maintenance goals, the cumulative amount of ERCs that was available January 1, 2018 (1 day after the base year) are added to the future (2024, 2027 and 2033) PM_{10} and NO_X planning emissions inventories. Below are descriptions of different types of ERCs and the total ERCs in tons per day (tpd) for each type of ERCs listed in Table 3-6.

3.5.1 Rice Burning ERCs

Rice burning credits have remained constant and have not changed since the approval of the First MP. Reductions in rice burning may be banked in the future under an ERC banking rule[17] currently in development. The total amounts of potential bankable rice burning ERCs in Sacramento County are listed in Table 3.6 on the line *Rice Burning Emissions Reduction Credits*.

California legislationin 1991 (known as the Connelly bill) required rice farmers to phase down rice field burning on an annual basis, beginning in 1992[18]. A burn cap of 125,000 acres in the Sacramento Valley Air Basin was established, and growers with 400 acres or less were granted the option to burn their entire acreage once every four years. Since the rice burning reductions were mandated by state law, they would ordinarily not be “surplus” and eligible for banking. However, the Connelly bill included a provision that the reductions qualified for banking if they met the State and local banking rules.

3.5.2 Wood Stove/Fireplace Change Out Incentive Program ERCs

The Wood Stove/Fireplace Change Out Incentive Program was established in June 2006 to provide financial incentives to remove or replace existing residential fireplaces and dirty wood stoves. About half of the emission reductions from this program will be available for the ERC bank[19] if the District adopts a rule to bank ERCs for the replacement of residential wood burning devices. The total number of potential bankable ERCs in Sacramento

[17] This rice burning ERC rule must be approved by EPA into the SIP for the rice ERCs to be used for compliance with federal air quality requirements.

[18] Connelly-Areias-Chandler Rice Straw Burning Reduction Act of 1991, Section 41865 of California Health and Safety Code.

[19] The other emission reductions were for the purpose of California Environmental Quality Act (CEQA) mitigation and were not bankable.

County is listed in Table 3.7 on the Wood Stove/Fireplace Change Out Incentive Program Credits line.

The methodology used to calculate the ERCs is based on the Sac Metro Air District's Residential Wood Combustion (RWC) Changeout Emissions Reduction Calculation (Sac Metro Air District, 2015). The methodology used average wood usage rates from the 2005 RWC emission inventory methodology for cordwood fireplaces, inserts, stoves and pellet stoves. This method will be the same method used to bank the emissions reductions resulting from the changeout program.

3.5.3 Privately Held ERCs

Privately held ERCs are the actual emission reductions certified and registered under Rule 204 and banked by a company or local government after the shutdown of an emission unit. Rule 204 also regulates the use or transfer of emission reductions credits by a source. Table 3-6 shows the total amount (tpd) of all privately held ERCs for PM_{10}, NO_X, and SO_X.

3.5.4 ERCs in the Community Bank and Priority Reserve Bank

Under District Rule 205, Community Bank and Priority Reserve Bank, ERCs that are owned by the District[20] are allocated to either the Community Bank or the Priority Reserve Bank and can be loaned to sources to offset increases of permitted emission levels. The Priority Reserve Bank is further divided into two accounts: Military Base Account and Essential Public Service Account and is established for the purpose of providing loans of emission reduction credits for use as offsets for new or modified stationary sources that are essential public services or use or reuse of a military base.

The District calculated the amount of unused ERCs for NO_X and PM_{10} from the Community Bank and Priority Reserve Bank. These available ERCs are listed in Table 3-6 on the line *Community Bank and Priority Reserve Bank ERCs.*

3.5.5 Summary of Emission Reduction Credits

Total ERCs include available credits as of January 1, 2018 from the following categories:

- Rice Burning
- Wood Stove/Fireplace Change Out Incentive Program
- Privately Held
- Community Bank and Priority Reserve Bank

[20] The credits that were used to create that bank came from the shutdown of the B-52 program when Mather Air Force Base closed.

These ERCs are in tons per day for an average winter day and will be included in the PM_{10} maintenance demonstration for 2024, 2027, and 2033. ERCs include a total of 0.3 tpd of PM_{10}, 1.7 tpd of NO_X and 0.3 tpd of SO_X.

Table 3-6 Emission Reduction Credits available as of January 1, 2018

Emissions in tons/day (avg. winter day)	**PM_{10}**	**NO_X**	**SO_X**
Future Bankable Rice Burning ERCs[1]	0.109	0.090	0.019
Wood Stove/Fireplace Change Out Incentive Program	0.085	0.002	0.001
Privately Held ERCs	0.038	1.235	0.190
Community Bank and Priority Reserve ERCs	0.027	0.309	0.031
TOTAL ERCs	0.259	1.636	0.241
ERCs Added to the 2024, 2027, and 2033 Inventory (rounded up to 1 decimal point)	**0.3**	**1.7**	**0.3**

[1] This has not changed since the First MP Update

3.6 Emissions Inventory Conclusions

An emissions inventory is an account of pollutant emissions from many sources in an area. This maintenance plan includes an emissions inventory for total primary PM_{10} emissions and PM_{10} precursor emissions from NO_X. An examination of the emissions inventory indicates that the three largest categories of primary PM_{10} are the areawide sources for paved road dust, residential fuel combustion, and construction & demolition. The three largest sources of NO_X emissions are on-road mobile sources, other mobile sources and residential fuel combustion. Between 2017 and 2033, the total PM_{10} emissions are expected to increase by about 8%, and the total NO_X emissions are projected to decrease by about 44%. The combined inventory of PM_{10} and NO_X precursors is projected to decrease by about 19% from 69 tons per day to 57 tons per day. This emissions inventory is projected to decrease in the future years despite an increase in vehicle miles traveled and population in Sacramento County during the same period.

4. Control Measures

4.1 Introduction to Control Measures

The Second Maintenance Plan (MP) must demonstrate, as required by Clean Air Act (CAA) Section 107(d)(3)(E), that the improvements in air quality leading to attainment and continued compliance is based on permanent and enforceable measures. This chapter briefly describes the control measure requirements and identifies the appropriate control measures that enable Sacramento County to continue to maintain the PM_{10} National Ambient Air Quality Standards (NAAQS). This includes a combination of actions taken by local, state, and federal agencies to reduce PM_{10} and Nitrogen Oxides (NO_X) emissions from various source categories. Control measures are developed and adopted into regulatory rules and programs, which are then implemented, monitored, and enforced. No new control measure commitments are included in the Second MP since the ambient concentrations in the county have remained below the PM_{10} National Ambient Air Quality Standards (NAAQS)[21] and are expected to remain below the standard through the second 10-year maintenance period (see Maintenance Demonstration in Chapter 5).

4.2 District Rules

Rules that have been previously adopted and used to bring the region into attainment and maintenance for the PM_{10} standard are discussed below. The United States Environmental Protection Agency (EPA) Reasonably Available Control Measures (RACM) for PM_{10} include:

1. Fugitive dust control measures,
2. Residential wood combustion control measures, and
3. Prescribed burning control measures.

4.2.1 Fugitive Dust Control Measures

Fugitive dust is particulate matter suspended in the air either by mechanical disturbance of the surface material or by wind action blowing across the surface. RACM for fugitive dust primarily focuses on stabilizing the particulate on the road surface or eliminating the particulate. Several RACM measures have already been adopted in the past and are currently being enforced in the Sacramento area. An example is the California Vehicle Code (23114), which requires that haul trucks cover their load or maintain adequate freeboard. The Second MP does not include any additional fugitive dust control measures.

[21] The only violation of the PM_{10} NAAQS during the maintenance period for the First MP was a result of the Camp Fire Wildfire in 2018, which is being addressed through the Exception Event Demonstration for November 2018 PM_{10} Exceedances in Sacramento County Due to Wildfires (Sac Metro Air District, 2021).

The District will continue to implement the following existing control measures to continue to mitigate and reduce fugitive dust emissions:

Rule Number and Topic	Date Initially Adopted
• Rule 401 Ringelmann Chart/Opacity	08-03-1977
• Rule 403 Fugitive Dust	08-03-1977
• Rule 404 Particulate Matter	03-11-1970
• Rule 405 Dust and Condensed Fumes	08-01-1962

4.2.2 Residential Wood Combustion Control Measures

Incomplete combustion in residential wood stoves and fireplaces can lead to elevated PM_{10} concentrations. The residential wood combustion control measures are intended to reduce emissions from existing stoves and fireplaces through inspections, education, shifting to cleaner fuels, voluntary or mandatory curtailment of burning during meteorological conditions that trap particulates (such as stagnant air and inversions), and limit the future growth of wood combustion emissions. The highest recorded PM_{10} levels in the county (excluding exceptional events) have occurred during the winter months when stagnation and inversions were evident.

The largest single source of Sacramento County's wintertime direct $PM_{2.5}$ emissions is wood, pellet, and other solid fuel burning in fireplaces, fireplace inserts, woodstoves, and pellet stoves. The following District measures will continue to be implemented to reduce residential wood combustion emissions. Because $PM_{2.5}$ emissions are a component of PM_{10} emissions, these strategies will also help reduce PM_{10} emissions. Although these measures were adopted and implemented after the area attained the federal PM_{10} 24-hour standard, the implementation of these measures will continue to help maintain the standard.

- The Wood Stove/Fireplace Change Out Incentive Program was established in June 2006 to provide financial incentives to remove or replace existing fireplaces and dirty wood stoves.
- Rule 417, Wood Burning Appliances, was approved by the Board of Directors on October 26, 2006, to prohibit installing new fireplaces and dirty wood burning devices.
- Rule 421, Mandatory Episodic Curtailment of Wood and Other Solid Fuel Burning, was adopted on October 25, 2007, to restrict wood burning on forecasted high $PM_{2.5}$ days during November through February. It was amended on September 24, 2009 to tighten the $PM_{2.5}$ concentration thresholds for burning restrictions.

4.2.3 Prescribed Burning Control Measures

EPA has suggested that a prescribed burning program include the following elements:

- smoke dispersion evaluation
- burn planning, authorization, and administration
- requirements to ensure burner qualifications
- public education and awareness
- surveillance and enforcement
- emissions inventories and emission efforts
- state oversight

The existing District Rule 501 – Agricultural Burning (initially adopted September 13, 1971) contains measures meeting each element and consequently and meets the RACM requirements for prescribed burning. In addition, Sacramento County is included in the Sacramento Valley Air Basin Smoke Management Program (CARB, 2001), which ensures that agricultural burning is prohibited on days meteorologically conducive to elevated PM_{10} concentrations.

4.2.4 Other Burning Control Measures

The following District measures will continue to be implemented to reduce burning emissions:

Rule Number and Topic	Date Initially Adopted
• Rule 407 Open Burn	03-11-1970
• Rule 408 Incinerator Burning	03-11-1970
• Rule 409 Orchard Heaters	05-15-1972

4.2.5 RACT Measures

Reasonably available control technology (RACT) is the lowest emission limitation that a particular source is capable of meeting by the application of control technology that is "reasonably available" considering technological and economic feasibility. Sac Metro Air District's various fugitive dust and combustion restriction rules have been applied to major stationary sources within Sacramento County to reduce PM_{10} emissions and meet RACT requirements.

In addition to RACT for major PM_{10} stationary sources[22], CAA Section 189(e) suggests that moderate PM_{10} nonattainment areas apply RACT for major stationary sources of PM_{10} precursors, unless EPA determines such sources do not contribute significantly to PM_{10} exceedance levels (Calcagni, 1991). The District has applied RACT rules to existing NO_X sources. The NO_X RACT evaluation of reduction measures was completed to satisfy the ozone nonattainment mandate (Sac Metro Air District, 2017). That evaluation demonstration also satisfies the RACT requirements for PM_{10} required due to the

[22] A review of the 2018 Point Source Inventory showed that there were no PM_{10} sources that would be classified as major sources based on the 100 tons per year threshold.

secondary formation of atmospheric ammonium nitrates, which are a significant component of PM_{10} concentrations in the Sacramento area.

The following District control measures to reduce NO_X emissions from existing stationary sources will continue to be implemented:

- Rule 411 – NO_X from Boilers, Process Heaters, and Steam Generators (initially adopted 02/02/1995)
- Rule 412 – Stationary Internal Combustion Engines Located at Major Stationary Sources of NO_X (initially adopted 06/01/1995)
- Rule 413 – Stationary Gas Turbines (initially adopted 04/06/1995)
- Rule 414 – Natural Gas Fired Water Heaters[23] (initially adopted 08/01/1996)
- Rule 419 - NO_X from Miscellaneous Combustion Units (initially adopted 07/26/2018)

State Control Measures

Several emission reductions programs have been implemented by CARB to reduce directly emitted particulates and secondary particulate matter (PM) precursor pollutants such as NO_X. These measures primarily address cleaner fuel specifications for diesel and reformulated gasoline, and mobile source engine emission standards that CARB has implemented statewide.

4.3 New Source Review Program and Prevention Significant Deterioration (PSD)

CAA Sections 172(c)(5) and 189(a)(1)(A) require the State Implementation Plan (SIP) to include provisions for a new source review (NSR) program to require permits for the construction and operation of new or modified major stationary sources anywhere in the nonattainment area, in accordance with CAA Section 173, Permit Requirements. However, Sacramento County has been redesignated to attainment, so it is now under PSD requirements as described below.

PSD is applicable for a:

- New major source; or
- Major source making major modification in an attainment area.

[23] Rule name has been updated to "Water Heaters, Boilers and Process Heaters Rated Less Than 1,000,000 BTU Per Hour."

PSD requirements stipulate that approval to construct cannot be granted to a proposed new major source or major modification if it would cause or contribute to a NAAQS or increment violation. PSD Permit requirements include:

- Install Best Available Control Technology (BACT);
- Perform air quality analysis to assess impacts on air quality;
- Assess impacts on national parks & wilderness areas; and
- Allow for public involvement opportunities.

4.4 Control Measures Conclusions

The Sac Metro Air District has adopted and implemented several control measures to reduce PM and NO_X emissions, including control measures for fugitive dust, wood burning devices, agricultural burning, and combustion equipment. In addition, the District has applied RACT rules to existing PM_{10} and NO_X sources, which will directly reduce fugitive dust, combustion particulates, and the secondary formation of atmospheric ammonium nitrates, a significant component of secondary PM_{10}. No new control measure commitments are included in the Second MP since the existing control measures are predicted to maintain the PM_{10} NAAQS throughout the second 10-year maintenance period.

5. Maintenance Demonstration

5.1 Introduction

This chapter describes the analysis used to demonstrate maintenance of the 24-hour PM_{10} National Ambient Air Quality Standards (NAAQS) from 2024 through 2033. According to United States Environmental Protection Agency (EPA) guidance (Calcagni, 1992, p. 9), the maintenance of the NAAQS may be demonstrated by "either showing that future emissions of a pollutant or its precursors will not exceed the level of the attainment inventory, or by modeling to show that future mixes of sources and emission rates will not cause a violation of the NAAQS."[24] The maintenance demonstration relies on the later approach where it uses the proportional rollback analysis to show that the future mixes of sources and concentrations will not cause a violation of the 24-hour PM_{10} NAAQS (150 $\mu g/m^3$).

5.2 Proportional Rollback Analysis Overview

A proportional rollback analysis calculates a future year's ambient concentration by using the change in air pollution emissions between certain years (emission inventory ratios) and an observed baseline concentration value. Details of the years, source categories, and concentration values used in this analysis are explained in respective sections below.

The First Maintenance Plan (MP) used a PM_{10} proportional rollback analysis to demonstrate maintenance of the standard during the time period of 2012-2022. To determine if the same approach would still be appropriate to use for the Second MP, the District evaluated the results of the First MP. In reviewing the First MP results, the District found: 1) the proportional rollback analysis successfully predicted a downward trend in future ambient concentrations (see Section 2.5); and 2) emissions inventory trends that were observed as part of the First MP have not changed, which indicates that the primary PM_{10} sources have not changed. Based on this review of the proportional rollback model, the District determined a similar methodology would be appropriate to demonstrate maintenance in the Second MP. The only difference from the First MP is the addition of the effect of background in the proportional rollback demonstration. Background concentrations are not affected by the local emissions and are assumed not to change in the future year's ambient concentrations.

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[24] Calcagni (1992) clarifies that the maintenance demonstration should be based upon the same level of modeling that was done in the attainment demonstration. Modeling for attainment demonstration was required so the maintenance demonstration for the Second MP will be based on what was done for the First MP.

5.3 Emissions Inventory Summary

In this analysis, California Emissions Projection Analysis Model (CEPAM) 2019: External Adjustment Reporting Tool Version 1.02, the most recent emission inventory, is used to develop the change in emissions over time. The ratio of emissions forecast in future years to the base year are used to project the PM_{10} concentrations in 2024, 2027, and 2033 (See Section 5.4). Table 5-1 shows the emissions inventory summary for 1995 (PM_{10} Chemical Mass Balance (CMB) modeling year), 2017 (emissions inventory base year), 2024 (first year of Second MP period), 2027 (an interim year), and 2033 (last year of the Second MP period). The detailed emissions inventory is available in Appendix B.

Table 5-1 PM_{10} and Precursors Emissions Inventories for Sacramento County

	Emissions Inventory (tons/day, winter average)				
Emissions	**1995***	**2017**	**2024**	**2027**	**2033**
Nitrogen Oxides (NO_X)	118.2	35.8	23.6+1.7** +0.5***	22.0+1.7**	20.1+1.7**
Sulfur Oxides (SO_X)	2.2	0.9	0.9+0.3**	0.9+0.3**	1.0+0.3**
PM_{10} (total)	33.0	33.6	33.8+0.3**	35.1+0.3**	36.4+0.3**
Mobile Source PM_{10}[1]	3.6	2.8	2.5	2.5	2.5
Wood Burning PM_{10}[2]	10.2	9.4	9.2	9.1	9.1
Fugitive Dust PM_{10}[3]	17.8	19.9	20.5	21.8	23.1
Unaccounted Mass PM_{10}[4]	1.5	1.6	1.6	1.7	1.8

* This emissions table is prepared using CEPAM 2019: External Adjustment Reporting Tool Version 1.02 emissions inventory. However, this CEPAM emissions inventory model only dates to 2000. The 1995 emissions inventory was based on the emissions inventory of the first MP. The methodologies preparing these emissions inventories are not the same.

** The number after the first "+" sign for emissions in 2024, 2027, and 2033 are the Emissions Reduction Credits (ERCs)(See Section 3.6). ERCs are potential emissions for Sacramento County and are included so that the projected ratios will be more conservative.

*** 0.5 tpd of NO_X as Safety Margin of the Motor Vehicle Emissions Budget for 2024.

1 Mobile Source PM_{10} emissions are the sum of On-Road Motor Vehicle Emissions and Other Mobile Emissions (see Table 3-1).

2 The Wood Burning PM_{10} emissions are the sum of emissions under the Residential Fuel Combustion, Fires, and Managed Burning and Disposal sub-categories. Detailed calculation is available in the Appendix B-01 CEPAM v1.02 with External Adjustment Factor.xls.

3 The Fugitive PM_{10} emissions are the sum of emissions under the Mineral Processes, farming operations, construction and demolition, paved road dust, unpaved road dust, and fugitive windblown dust sub-categories. Detailed calculation is available in the Appendix B-01 CEPAM v1.02 with External Adjustment Factor.xls.

4 The Unaccounted Mass PM_{10} is the direct PM_{10} emissions not included in the mobile source, wood burning, and fugitive dust categories. It is not being used in the following calculation.

The emissions inventory shows that NO_X emissions will decrease over time**.** NO_X is a PM_{10} precursor, and continuing the reduction in NO_X concentrations, especially in the mobile source category, will be critical in reducing future PM_{10} concentrations. According to a study conducted in Sacramento (Wang, 2010), mobile source emissions represent 62.2 percent of measured ambient annual PM_{10} concentration. This study also found that NO_X emissions from mobile sources significantly contribute to the formation of secondary particulate matter. Another study (EEA, 2017) found that NO_X emissions (87%) were the most significant pollutant contributing to atmospheric PM_{10} concentrations in 2004.

The emissions inventory also shows that PM_{10} and SO_X emissions will slightly increase from 2017 to 2033. The primary increase in PM_{10} is driven by the PM_{10} fugitive dust source category due to the expected population growth and a slight increase in vehicle miles traveled (VMT) in the region. SO_X emissions were evaluated as part of the proportional rollback analysis although its contributions were shown to be insignificant (see Section 3.3). SO_X will slightly increase due to an increase in aircraft emissions and industrial processes. Volatile Organic Compounds (VOCs) were not identified as contributing to the PM_{10} concentrations in the CMB Model and therefore are not included in the proportional rollback analysis.

This maintenance demonstration shows that the decrease in NO_X emissions reduces the projected ambient PM_{10} concentrations despite the slight increase in direct PM_{10} and SO_X emissions.

5.4 PM_{10} Proportional Rollback Analysis

5.4.1 Chemical Mass Balance Modeling Results

CMB receptor modeling results for 1991-1996 wintertime (Nov-Jan) ambient 24-hour PM_{10} samples (>40 μg/m^3) from the Sacramento T-Street monitor were used to derive a source profile to represent high value 1995 PM_{10} winter concentrations. The modeling results, shown in Table 5-2, are separated by the PM_{10} source categories and their associated concentrations (Sac Metro Air District, 2010, p 6-4).

Table 5-2 1995 CMB ambient PM_{10} source profile

PM_{10} CMB Source Category	1995 CMB Modeling Results	
	(μg/m^3)	(% Total)
Ammonium Nitrate	14.90	28.92%
Ammonium Sulfate	2.27	4.41%
Motor Vehicles	11.79	22.88%
Wood Smoke	8.57	16.63%
Fugitive Dust	6.40	12.42%
Unidentified Other	7.60	14.75%
PM_{10}	51.53	100.00%

5.4.2 Background Concentrations

The District examined PM_{10} monitoring locations and concentrations collected at monitoring stations within and surrounding Sacramento County to determine which data might represent the background PM_{10} values. The District used the PM_{10} data from the Bliss Monitoring Station in the Interagency Monitoring of Protected Visual Environments (IMPROVE) monitoring network, which is located at the Bliss State Park, in El Dorado County, on the western shore of Lake Tahoe. This monitoring station is at about 6,000 feet in elevation and is in a rural location with very few PM_{10} anthropogenic sources. Concentrations measured at this station during the base year (2017) were used to determine the annual average PM_{10} concentration of 5.7 $\mu g/m^3$ [25]. This concentration was assumed to represent the total background PM_{10} concentration for Sacramento County. The background concentrations are assumed to remain constant and not change in the future and would remain even if all local anthropogenic emissions could be reduced to zero.

5.4.3 Proportional Rollback Analysis and Results

The PM_{10} CMB source category concentrations are adjusted by the ratio of the emissions inventory for the corresponding emissions category. The concentrations for the ambient PM_{10} source categories in 1995 have changed over time and do not reflect current ambient PM_{10} conditions. To account for the changes, the 1995 ambient PM_{10} source category concentrations were scaled up or down based on the changes in the emissions inventory. The proportional rollback analysis assumes that the changes in concentrations from local sources are directly proportional to the changes in the emission inventory.

Each CMB source category (Table 5-3, Column 1) was matched with a corresponding PM_{10} or PM_{10} precursor emissions category (Table 5-3, Column 2) for the purpose of projecting future concentrations. The 2017 Growth Adjusted Percentage (Column 5) was calculated by multiplying the ratio of the changes in the emission inventory source category between 1995 and 2017 (Table 5-3, Column 4) by the 1995 CMB Modeling Percentage Total (Table 5-3, Column 3). Values from Table 5-3, Column 5 were then normalized by dividing each source category 2017 Growth Adjusted Percentage by the total PM_{10} 2017 Growth Adjusted Percentage to get the Normalized 2017 Growth Adjusted Percentage (Table 5-3, Column 6). This value represents the percent contribution from each source category to the total PM_{10} ambient concentration for 2017 (Base Year) and was used in Table 5-4, Column 2.

For example, Table 5-3 shows the 1995 CMB source category modeling percentage of ammonium sulfate (matching emission category is SO_X) is 4.41%. The projection ratio in SO_X emissions inventory between 1995 and 2017 is 0.407 (2017 SO_X emissions/1995

[25] The 2017 background concentration data was extracted from EPA AQS on 06/2021.

SO_X emissions), which was then multiplied by the 1995 source category percentage (4.41%) to get the growth adjusted percentage of 1.79.

The ammonium nitrate concentration was adjusted by the change in the NO_X emission inventory at a ratio of 0.7 to 1, which means the ammonium nitrate concentration will change by 0.7% for every 1% change of NO_X emissions. This ratio was based on San Joaquin Valley Air Pollution Control District photochemical modeling results that discovered for 50% of NO_X emissions reduction, ammonium nitrate particulate reduces on average 35% (SJVAPCD, 2007, p.61).

Table 5-3 Estimated source category concentrations for the 2017 base year

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
PM_{10} CMB Source Category	**Matching Emission Category**	**1995 CMB* Modeling (% Total)**	**2017 Emissions Projection Factor**	**2017 Growth Adjusted Percentage (% Total)**	**Normalized 2017 Growth Adjusted Percentage (% Total)**
Ammonium Nitrate	NO_X	28.92	0.5122	14.81	18.88
Ammonium Sulfate	SO_X	4.41	0.407	1.79	2.29
Motor Vehicles	Mobile Source PM_{10}	22.88	0.7724	17.67	22.53
Wood Smoke	Wood Burning PM_{10}	16.63	0.9193	15.29	19.49
Fugitive Dust	Fugitive Dust PM_{10}	12.42	1.1181	13.89	17.70
Unidentified Other[1]	Total PM_{10}	14.75	1.0172	15.00	19.12
Total PM_{10}		100.00		78.46	100.00

* These percentages are from Table 5-2, Column 3

1 The unidentified other PM_{10} concentrations are forecasted using the change in total PM_{10} since their associated emissions source categories are not known.

This analysis relied on the peak ambient 24-hour PM_{10} concentration in the base year (2017), which was 149 µg/m^3 in Sacramento County[26]. This analysis was also repeated for the second highest 24-hour PM_{10} concentration for 2017 of 87 µg/m^3, which was more representative of ambient conditions. The background concentration of 5.7 µg/m^3 was subtracted from the peak and second highest concentrations. The percent contributions from each source category were applied to the peak concentrations to determine the source category concentrations. The 2017 ambient 24-hour PM_{10} peak and second highest concentrations were used to project the future peak concentrations in 2024, 2027,

26 This unusual high ambient concentration in 2017 was most likely impacted by high wind dust event or smoke from a wildfire event near the monitoring station. An exceptional event demonstration was not triggered because the peak concentration did not exceed the PM_{10} NAAQS of 150 µg/m^3.

and 2033. Each source category concentration was projected using the previously described projection method.

To project the change in concentrations from 2017 to 2024, 2027, and 2033, the projection factors (Table 5-4, Columns 4, 6, and 8) were calculated based on the emission inventory ratios in each of these years. Subsequently, each source category concentration in 2017 was multiplied by the projection ratio to determine the source category concentration in the future years, 2024, 2027, and 2033. The results are presented in Tables 5-4 and 5-5 for 2024, 2027, and 2033 (Table 5-4, Columns 5, 7, and 9). The sums of the projected source category concentration are the projected PM_{10} concentrations from local sources in the future years. The background concentration is added to the PM_{10} concentrations from local sources (shown in the second to last row) to get the projected total PM_{10} concentration.

The projected future 24-hour PM_{10} concentrations will be 142 µg/m^3 for 2024, 144 µg/m^3 for 2027, and 146 µg/m^3 for 2033. The projected future concentrations relied on the measured peak concentration in 2017, which was unusually high and suspected to be influenced by a high wind dust event and/or smoke from a wildfire event. Even so, the proportional rollback analysis showed that the predicted future PM_{10} concentrations in Sacramento County will remain below the PM_{10} NAAQS of 150 µg/m^3.

Table 5-4 Predicted Future Maintenance Year Concentrations based on 2017 Peak Ambient PM_{10} Concentration in Sacramento County

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7	Column 8	Column 9
PM_{10} CMB Source Category	**2017 Normalized Adjusted Growth Percentage (% Total)**	**2017 Peak Conc. (µg/m^3)**	**2024 Emissions Projection Factor**	**2024 Peak Conc. (µg/m^3)**	**2027 Emissions Projection Factor**	**2027 Peak Conc. (µg/m^3)**	**2033 Emissions Projection Factor**	**2033 Peak Conc. (µg/m^3)**
Ammonium Nitrate	18.88	27.1	0.8032	21.7	0.7621	20.6	0.725	19.6
Ammonium Sulfate	2.29	3.3	1.3260	4.3	1.3679	4.5	1.385	4.5
Motor Vehicles	22.53	32.3	0.8991	29.0	0.9101	29.4	0.921	29.7
Wood Smoke	19.49	27.9	0.9811	27.4	0.9727	27.2	0.966	27.0
Fugitive Dust	17.70	25.4	1.0303	26.1	1.0978	27.8	1.160	29.4
Unidentified Other	19.12	27.4	1.0152	27.8	1.0558	28.9	1.094	30.0
Total PM_{10} - Background	100.00	**143.3**		**136.4**		**138.4**		**140.3**
Background		5.7		5.7		5.7		5.7
Total PM_{10} (using peak conc.)		**149**		**142**		**144**		**146**

The District also conducted the proportional rollback analysis for the second highest ambient concentration in 2017 of 87 µg/m^3 and assumed the same background concentration of 5.7 μg/m³. These concentrations, although still potentially impacted by smoke from nearby wildfires, better represent the ambient PM_{10} conditions in Sacramento. Using the 2017 second highest concentration in the proportional rollback analysis, and after adding in the background concentration, the projected future 24-hour PM_{10} concentrations will be 83 μg/m³ for 2024, 84 μg/m³ for 2027, and 85 μg/m³ for 2033.

Table 5-5 Predicted Future Maintenance Year Concentrations based on 2017 Second Highest Ambient PM_{10} Concentrations in Sacramento County

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7	Column 8	Column 9
PM_{10} CMB Source Category	**2017 Normalized Adjusted Growth Percentage (% Total)**	**2017 Peak Conc. (μg/m³)**	**2024 Emissions Projection Factor**	**2024 Peak Conc. (μg/m³)**	**2027 Emissions Projection Factor**	**2027 Peak Conc. (μg/m³)**	**2033 Emissions Projection Factor**	**2033 Peak Conc. (μg/m³)**
Ammonium Nitrate	18.88%	15.3	0.8032	12.3	0.7621	11.7	0.725	11.1
Ammonium Sulfate	2.29%	1.9	1.3260	2.5	1.3679	2.5	1.385	2.6
Motor Vehicles	22.53%	18.3	0.8991	16.5	0.9101	16.7	0.921	16.9
Wood Smoke	19.49%	15.8	0.9811	15.5	0.9727	15.4	0.966	15.3
Fugitive Dust	17.70%	14.4	1.0303	14.8	1.0978	15.8	1.160	16.7
Unidentified Other	19.12%	15.5	1.0152	15.8	1.0558	16.4	1.094	17.0
Total PM_{10} - Background	100.00%	**81.3**		**77.4**		**78.5**		**79.6**
Background		5.7		5.7		5.7		5.7
Total PM_{10}		**87**		**83**		**84**		**85**

5.5 Verifying and Tracking the Maintenance Demonstration

EPA guidance[27] states that the maintenance plan should indicate how the progress of the maintenance plan will be tracked. Options for tracking the progress of the maintenance would be to periodically (typically every 3 years) review and update the emissions inventory, if needed, and reevaluate the assumptions and data used in the demonstration. During an event, the indicators for triggering the contingency plan (specified in Chapter 6) should also be monitored.

The Sac Metro Air District will review the assumptions and data for the PM_{10} maintenance demonstration in 2024, 2027, and 2033 to fulfill the verification and tracking requirements. The Sac Metro Air District will also continue to operate a PM_{10} ambient monitoring network in Sacramento County to track maintenance of the PM_{10} standard (as discussed in Chapter 2) and monitor the indicators for triggering the contingency plan. After the Second

27 Calcagni, 1992 states that "This is necessary due to the fact that the emission projections made for the maintenance demonstration depend on assumptions of point and area source growth."

10-year maintenance plan is complete, the Sac Metro Air District will no longer be required to have a maintenance plan in place.

5.6 Conclusions

Maintenance of the 24-hour PM_{10} NAAQS of 150 µg/m^3 was demonstrated by using the PM_{10} proportional rollback analysis. The PM_{10} proportional rollback analysis used the peak 24-hour PM_{10} concentrations in 2017 of 149 µg/m^3 to show that the predicted future concentrations will be below the standard at 142 µg/m^3 for 2024, 144 µg/m^3 for 2027, and 146 µg/m^3 for 2033. Because the 2017 peak concentration was potentially influenced by wildfire smoke or high wind dust event and not a reflection of local emissions, the PM_{10} proportional rollback analysis was also conducted for the second highest value in 2017 that better represented the ambient PM_{10} conditions. The second highest value was 87 µg/m^3, and the predicted future concentrations will be much lower than the standard at 83 µg/m^3 in 2024, 84 µg/m^3 in 2027, and 85 µg/m^3 in 2033. The District will continue to operate appropriate air monitoring network, review and update emission inventory, and reevaluate the assumptions and data used in this demonstration to verify that the county will continue to meet the 24-hour PM_{10} NAAQS.

6. Contingency Plan

6.1 Introduction to Contingency Plan

Clean Air Act (CAA) Section 175A (d) requires a maintenance plan to include a contingency plan to promptly correct any violation of the standard that occurs after redesignation of the area to attainment. The failure of any area, which has been redesignated as an attainment area, to maintain the National Ambient Air Quality Standards (NAAQS), however, shall not result in a requirement for a State Implementation Plan (SIP) revision unless United States Environmental Protection Agency (EPA), in its discretion, requires such submittal consistent with that requirement (CAA Section 175A).

The contingency plan is an enforceable part of the SIP and ensures that additional control measures are adopted expediently once they are triggered. However, EPA guidance states that fully adopted control measures that take effect without further action are not required for the maintenance plan to be approved (Calcagni, 1992).

This section describes the maintenance contingency plan. It outlines the process on how to review ambient air quality concentrations that would cause a violation of the PM_{10} NAAQS and actions to take once the contingency action is triggered.

6.2 Contingency Action Trigger

The contribution of sources to the PM_{10} problem can vary at different seasons of the year under a variety of different meteorological conditions. Therefore, the Sac Metro Air District will follow this contingency plan to evaluate applicable PM_{10} events that trigger a contingency action and take appropriate steps to ensure the area will remain below the PM_{10} NAAQS.

The District's contingency action will be triggered to promptly correct any violation of the standard that occurs during the maintenance period. Implementation of the contingency action during the maintenance period will not occur if a PM_{10} monitor violates the 24-hour PM_{10} NAAQS (150 $\mu g/m^3$) (the three-year average of the number of 24-hour PM_{10} NAAQS exceedances is greater than 1.0) due to exceptional events.

The District will follow the process below to determine if certain exceedances could be excluded from the contingency action trigger. This process is intended to evaluate between: 1) exceedances that are potentially caused by an exceptional event and, therefore, not within the District's or State's control; or 2) exceedances that are within the District's or State's control and should be considered in determining a violation.

The District will work with California Air Resources Board (CARB) to initiate the following steps to determine whether an exceedance is due to an exceptional event (if there is no exceptional event explanation available, the District will proceed to the Contingency Action stage in Section 6.3) the need to trigger the contingency action. The District and CARB will confer on information that should be submitted to EPA along with the Initial Notification Information (INI).

1. The District/CARB notifies EPA that District/CARB wants to exclude exceedance(s) from the contingency action trigger calculation if the exceedance(s) causes a violation of the NAAQS.[28] The District/CARB will notify EPA within four months after the quarter when the exceedance(s) that caused a violation was recorded.
    a. EPA and the District/CARB confer to determine additional information that should be submitted along with the INI (Note that EPA may request supplemental documentation under step 2b).
2. The District/CARB submits INI and additional information to EPA.
    a. EPA reviews the INI and any additional information and lets the District/CARB know if the exceedance(s) was caused by an exceptional event and doesn't need to be counted toward the contingency action trigger; or
    b. EPA reviews and lets the District/CARB know that EPA does not think the exceedance(s) was caused by an exceptional event or does not have enough information and that the District/CARB needs to provide supplemental documentation/analysis or count the exceedance(s) towards the contingency action trigger.
3. The District/CARB submits supplemental documentation (if needed)
    a. EPA reviews and notifies the District/CARB whether EPA agrees that the exceedance(s) looks like the exceedance(s) was caused by an exceptional event and does not need to be counted toward the contingency action trigger; or
    b. EPA reviews and notifies District/CARB whether EPA does not agree that the exceedance(s) was caused by an exceptional event and that the District/CARB needs to count it towards the contingency action trigger.
4. If District/CARB disagrees with EPA's decision (see Step 3b) on whether the exceedance(s) was caused by an exceptional event and does not want the exceedance(s) to count towards a contingency action trigger, the District/CARB must submit an exceptional event demonstration.

28 If the exceedance does not result in a violation of the 24-hour PM_{10} design value, the contingency actions will not be triggered.

a. EPA reviews and concurs that the exceedance(s) does not count towards the contingency action trigger[29]; or

b. EPA reviews and determines that the exceedance(s) counts towards the contingency action trigger.

This process will allow the District/CARB to determine if either: a) the contingency actions are not triggered due to an exceptional event; or b) contingency actions are triggered and additional control measures are needed (see Contingency Action).

6.3 Contingency Action

If the exceedance(s) that leads to a violation of the NAAQS was not caused by an exceptional event, the District will analyze the event to determine its possible causes and take action. Any applicable emission reductions from already adopted rules that have not yet been implemented would be evaluated to determine if these new emission reductions would be sufficient to prevent future exceedances of the PM_{10} standard. Previously adopted rules by either CARB and/or District could include PM_{10} and/or Nitrogen Oxides (NO_X) measures used to address ozone and PM_{10} SIP requirements[30]. In addition, the District would evaluate applicable reasonably available control measures (RACM) that could potentially provide the corrective action needed.

The District will look at implementation of new rules and/or modifications to existing rules if the additional emission reductions from already adopted rules are insufficient to bring the region back into maintenance. The District will determine what would be appropriate to implement to reduce PM_{10} emissions to bring the region back into maintenance. The specific rules that will be explored depend on the cause for the exceedances. A list of potential control measures is available in Appendix C as reference.

For example, if it were determined that non-exceptional event exceedances were a result of excessive woodsmoke, then an additional control measure based on Rule 417, (Wood Burning Appliances), or Rule 421 (Mandatory Episodic Curtailment of Wood and Other Solid Fuel Burning) would be appropriate.

If the District determines that the contingency action has been triggered, the District will aim to complete its analysis of the exceedances and evaluate the most appropriate control measures to adopt/implement within 6 months. This will be followed by a 12-month period, when all applicable control measures will be adopted/implemented to achieve the

[29] If the process ends in Step 4a, the data in Air Quality System (AQS) will not be affected. A full exceptional event demonstration and concurrence would be required to exclude data from the design value calculations.

[30] As discussed in Chapter 6, Control Measures, because $PM_{2.5}$ emissions are a component of PM_{10} emissions, these strategies could include $PM_{2.5}$ control measures, which will also help reduce PM_{10} emissions.

necessary reductions. This allows a total of 18 months after the contingency action is triggered to evaluate, select, develop (if necessary) and adopt/implement the most appropriate control measures. The rule development and adoption process would be subject to individual and specific public review and a separate Board of Directors public hearing.

6.4 Contingency Plan Conclusions

The contingency plan is expected to ensure prompt correction of any violation of the PM_{10} NAAQS during the second maintenance period. The contingency plan identifies a specific indicator or trigger to determine when the contingency actions are activated for evaluating, selecting, developing, and adopting the most appropriate control measures to achieve the necessary reductions within 18 months of a contingency action being triggered.

7. Transportation Conformity

7.1 Introduction to Transportation Conformity

Transportation conformity is the federal regulatory procedure for linking and coordinating the transportation and air quality planning processes. Under the 1990 Clean Air Act (CAA) Amendments, federal agencies may not approve or fund transportation plans and projects unless they are consistent with state air quality state implementation plans (SIPs). Conformity with the SIP requires that transportation activities (1) not cause or contribute to new air quality violations, (2) increase the frequency or severity of any existing violation, or (3) delay timely attainment of National Ambient Air Quality Standards (NAAQS). The quantification and comparison of on-road motor vehicles emissions is one of the elements for determining transportation conformity between air quality and transportation planning.

This chapter provides a summary of principal transportation conformity requirements and proposed motor vehicle emissions budgets (MVEB) for PM_{10} and Nitrogen Oxides (NO_X).

7.2 Transportation Conformity Requirements

The CAA Section 176 states that no federal department engage in, support in any way or provide financial assistance for or license or approve any activity that does not conform to the applicable SIP in effect. To implement this requirement, the United States Environmental Protection Agency (EPA) established the Transportation Conformity Rule (USEPA, Subpart A, 40 CFR §93.100 – §93.129). This Rule:

- Establishes criteria and procedures for determining whether long range metropolitan transportation plans (MTPs), short range metropolitan transportation improvement programs (MTIPs), and projects conform to the SIP.
- Ensures that transportation plans and projects are consistent with the applicable SIP, such that associated transportation emissions are less than or equal to the MVEB established for demonstrating reasonable further progress, attainment or maintenance of health-based air quality standards.
- Ensures that transportation plans, programs, and other individual projects do not cause new air quality violations, exacerbate existing ones, or delay attainment of air quality standards.

Total emissions, from all sources, are assessed when determining maintenance but only the portion of on-road emissions from the emissions inventory are used when developing the MVEB.

7.3 Latest Planning Assumptions

The MVEB must be based on the latest planning assumptions. Sacramento County has had rapid growth in population, number of households, number of dwelling units, and jobs in the last two decades, and these trends are expected to continue. Forecasting of these factors is important in establishing the MVEB.

Sacramento Area Council of Governments

Sacramento Area Council of Governments (SACOG), the Metropolitan Planning Organization (MPO) for the 6-county Sacramento region[31], adopts population, dwelling units, and employment forecasts, which are applied to vehicle miles traveled (VMT) forecasting. The current and forecasted VMT estimates are from SACOG-supplied activity data, which are from SACOG's regional travel demand forecasting model, Sacramento Activity-Based Travel Simulation Model (SACSIM) (Bradley et al, 2007). SACOG used the SACSIM travel demand model to forecast average weekday travel patterns for several future years, based on given assumptions about expected future population and employment projections, land use allocations, and transportation system improvements and changes contained in the 2020 Metropolitan Transportation Plan/Sustainable Communities Strategy (MTP/SCS) (SACOG, 2019). The travel model predicted that growth in vehicle trips and growth in vehicle miles traveled will be slightly lower than the population growth rate for the Sacramento region through 2040.

MVEB were calculated based on data included in the 2020 MTP/SCS, which was adopted by SACOG on November 18, 2019[32] (SACOG, 2019). The proposed transportation budgets listed in Table 7.1, incorporate the following planning assumptions from SACOG:

1) Population, households, housing, and employment projections from SACOGs 2020 MTP/SCS, and
2) VMT Forecasts used in SACOGs 2020 MTP/SCS

Other Planning Assumptions

EMission FACtor (EMFAC) 2017 and approved off model adjustments, were used to develop emission estimates for the conformity determinations.[33] CARB adjusted the transportation conformity budgets for the second PM_{10} maintenance plan based on the release of the Safer Affordable Fuel-Efficient (SAFE) Vehicle Rule Part One (85 FR 24174).[34] The adjustment factors reflect the impact of the SAFE rule as described in the

31 The six counties include Sutter, Placer, Yolo, Yuba, Sacramento, and El Dorado.

32 The 2020 MTP/SCS can be found at: https://www.sacog.org/2020-metropolitan-transportation-plansustainable-communities-strategy-update and the Conformity Analysis adopted as part of the 2020 MTP/SCS was Amendment #18 to the 2019-22 Metropolitan Transportation Improvement Program (MTIP) can be found at: https://www.sacog.org/sites/main/files/file-attachments/attachment_i-_aq_conformity_documentation.pdf?1573685828

33 EPA's approved the use of the EMFAC2017 emissions model for SIP and conformity purposes effective August 15, 2019.

34 The SAFE Rule became effective on July 29, 2020: < https://www.govinfo.gov/content/pkg/FR-2020-04-30/pdf/2020-06967.pdf >

memorandum (CARB, 2019). Table 7-1 incorporated the following additional planning assumptions:

1) EMFAC 2017 and approved off model adjustments for SAFE Rule Part One,
2) The recent on-road motor vehicle emission inventory factors of EMFAC2017 (CARB, 2017),
3) Latest regional and state control strategies.

7.4 Proposed Motor Vehicle Emission Budgets

The District established the emissions budgets shown in Table 7-1 in coordination with SACOG, CARB, and EPA to satisfy the requirements in USEPA, Subpart A, 40 CFR, §93.118(e)(4). Emissions budgets were established for the first year (2024), interim year (2027) and the last year (2033) of the Second 10-year Maintenance Plan and reflect the limit of allowable emissions in the year they are defined and all subsequent years until a budget for a new year is established. The conformity rule states that “emissions in years for which no motor vehicle emissions budgets are specifically established must be equal to the motor vehicle emission budget(s) established for the most recent prior year” (40 CFR 93.118(b)(1)(ii)). As such, emission budgets established for 2024 will be applied for conformity analysis before 2027, and budgets established in 2027 will be applied to conformity analysis before 2033, and budgets established for 2033 will be applied for conformity analysis for 2033 and all future years.

<u>Emissions Parameters</u>

The Transportation Conformity Rule (40 CFR §93.102(b)(2)(iii))[35] states that as the primary pollutant, MVEB must be developed for PM_{10} and if deemed a significant contributor (precursor pollutant) to the PM_{10} nonattainment problem, for volatile organic compounds (VOCs) and/or NO_X. An analysis of the precursors to PM_{10} emissions (Section 3.3) based on the Chemical Mass Balance (CMB) model showed that VOCs emissions did not contribute to the wintertime ambient PM_{10} concentrations. NO_X emissions were shown to contribute significantly to the wintertime ambient PM_{10} concentration. NO_X reacts with ammonia to form ammonium nitrate, a subcategory of PM_{10}. Although not a requirement of the Transportation Conformity Rule, emissions from Sulfur Dioxide (SO_2) were evaluated and found to be an insignificant contributor to the PM_{10} concentrations.

<u>Emission Budgets and Budget Categories</u>

Table 7-1 shows the proposed MVEB for NO_X and PM_{10} for an average winter day (rounded up to the nearest tenth of ton per day (tpd)) in Sacramento County (the

[35] This applies to all nonattainment and maintenance areas for transportation-related criteria pollutants for which the area is designated nonattainment or has a maintenance plan.

nonattainment area for the federal PM_{10} standard). The MVEB was The MVEB for NO_X are based on combustion sources and are a result of on-road motor vehicles. The MVEB for PM_{10} are broken down into emissions from the following categories:

- Direct Exhaust (includes tire and brake wear) – This includes directly emitted PM_{10} motor vehicle emissions from the brake wear and tire wear. Adjustment factors were used by California Air Resources Board (CARB) to reflect the impact of the SAFE Rule as described in the memorandum as part of the conformity budgets (CARB, 2019).
- Transportation Related (Road) Construction Dust PM_{10} Emissions (40 CFR §93.122(e)) of the conformity regulation requires conformity determinations to include fugitive dust PM_{10} emissions from highway and transit construction wear activities.
- Re-Entrained Paved and Unpaved Road Dust PM_{10} Emissions – The March 10, 2006 Final Rule, which established criteria for PM_{10} (and $PM_{2.5}$) conformity determinations (71 FR 12498) indicated that road dust must be included in regional conformity determinations (40 CFR §93.119(f)(8)).[36]
- Safety Margin – US EPA Transportation Conformity Rule (40 CFR §93.124(a) allows an implementation plan to explicitly increase the MVEB for available use by the Metropolitan Planning Organization (MPO) and the Department of Transportation (DOT) for conformity purposes as long as emissions will be lower than needed to provide for continued maintenance. The safety margin is defined as the difference between projected emissions and the emissions necessary to demonstrate attainment.

[36] This states that EPA has intended for road dust emissions to be included in all conformity analyses of direct PM_{10} emissions.

Table 7-1 Motor Vehicle Emissions Budgets for PM_{10} Maintenance Plan (Winter Season)

Sacramento (Tons/Day)	2024		2027		2033	
	NO_X	PM_{10}	NO_X	PM_{10}	NO_X	PM_{10}
Vehicular Exhaust[a], (Includes Tire, and Brake Wear for PM_{10})	10.68	2.09	9.57	2.17	8.30	2.27
Re-Entrained Paved Road Dust (Total)	N/A	8.25	N/A	8.52	N/A	9.15
Re-Entrained Unpaved Road Dust (City and County Roads)	N/A	0.62	N/A	0.61	N/A	0.59
Road Construction Dust	N/A	3.65	N/A	4.04	N/A	4.31
Safety Margin	0.5	N/A	N/A	N/A	N/A	N/A
Total[b]	11.18	14.62	9.57	15.34	8.30	16.32
Motor Vehicle Emission Budget[c]	11.2	14.7	9.6	15.4	8.4	16.4

[a] This reflects the adjustment factor for SAFE Vehicle Rule using EMFAC2017.

[b] Values from California Emissions Projection Analysis Model (CEPAM) 2019: External Adjustment Reporting Tool Version 1.02 may not add up due to rounding.

[c] Motor Vehicle Emission Budgets are rounded up, from the previous row, which show the Total, to the nearest tenth of a tpd.

Source: CEPAM 2019: External Adjustment Reporting Tool Version 1.02 and EMFAC2017

Safety Margin

An additional 0.5 tons per day of NO_X was added to the 2024 NO_X budgets. This safety margin was included to accommodate the increased emissions due to the modeling inputs and assumptions seen from switching from EMFAC2014 to EMFAC2017. Previous conformity determinations from SACOG were based on EMFAC2014. SACOG will be using EMFAC 2017 in their next MTIP update in December 2022 (this will include the years 2023 through 2026) and the next MTP approval in 2023 or 2024.

Including the safety margin in 2024 for NO_X will not impact the ability to demonstrate maintenance in the future. Based on the proportional rollback analysis, the addition of 0.5 tpd of NO_X in 2024 will increase the future PM_{10} concentrations in 2024 by less than 0.3 µg/m^3. Therefore, the addition of the safety margin meets the requirements of 40 CFR §93.124(a).

7.5 Impact of New MVEB

The First Maintenance Plan (MP) established emissions budgets for PM_{10} and NO_X for 2008, 2012, and 2022 and these budgets will remain in effect until the budgets established in the Second MP are found adequate by EPA. SACOG will then be required to use the budgets established in the Second MP in the development and amendments to their Transportation Plans.

8. General Conformity

8.1 Introduction to General Conformity

General conformity is the federal regulatory process for preventing major federal actions[37] or projects from interfering with air quality planning goals. Conformity provisions ensure that federal funding and approval are given only to those activities and projects that are consistent with state air quality implementation plans (SIPs). Conformity with the SIP means that major federal actions will not cause new air quality violations, worsen existing violations, or delay timely attainment of the National Ambient Air Quality Standards (NAAQS).

Current federal rules require that federal agencies use the emissions inventory from an approved SIP's attainment or maintenance demonstration to support a conformity determination. The emissions inventory in this second PM_{10} maintenance plan may be used for general conformity purposes. A detailed emissions inventory is provided in Appendix B for the future general conformity analysis.

8.2 General Conformity Requirements

Clean Air Act (CAA) Section 176 states that no federal department may engage in, support, provide financial assistance, license, or approve any activity that does not conform to an approved SIP.

The United States Environmental Protection Agency (EPA) promulgated the conformity regulations for general federal actions (75 FR 17254; 40 CFR 51.851; 40 CFR 93 Subpart B); CAA section 176(c)). The "General Conformity" Rule sets the requirements a federal agency must meet to make a conformity determination. General conformity does not allow federal agencies and departments to support or approve an action that does any of the following (40 CFR §93.153(g)(1)):

- Causes or contributes to new violations of any NAAQS in an area;
- Interfere with provisions in the applicable SIP for maintenance of any standard;
- Increases the frequency or severity of an existing violation of any NAAQS; or
- Delays timely attainment of any NAAQS or any required interim emission reductions or other milestone.

8.3 Types of Federal Actions Subject to General Conformity Requirements

Examples of general federal actions that may require a conformity determination include, but are not limited to, the following: leasing of federal land, private construction on federal

[37] Federal actions are defined as any activity engaged in by a department, agency, or instrumentality of the Federal government, or any activity that they support, fund, license, permit, or approve, other than activities related to transportation plans, programs, and projects that are applicable to transportation conformity requirements. (40 CFR §93.152)

land, reuse of military bases, airport construction and expansions, construction of federal office buildings, and construction or modifications of dams or levees. These actions are further discussed in 40 CFR §93.153.

General conformity requirements (40 CFR §93.153) apply if direct or indirect emissions from a federal action has the potential to exceed the *de minimis* threshold levels established for each criteria or precursor pollutant in a nonattainment area or maintenance area. The thresholds are shown in 40 CFR §93.153(b)(1)(2). For a moderate PM_{10} nonattainment area, the threshold level is 100 tons per year of PM_{10} or Nitrogen Oxides (NO_X).

Direct emissions of a criteria pollutant or its precursors (40 CFR §93.152) are emissions that are caused or created by the federal action and occur at the same time and place as the action. Indirect emissions are reasonably foreseeable emissions that occur within the same nonattainment area as the project but are further removed from the federal action in time and/or distance and can be practicably controlled by the federal agency due to a continuing program responsibility (40 CFR §93.152). A federal agency can indirectly control emissions by placing conditions on federal approval or federal funding. An example would be controlling emissions by limiting the size of a parking facility or by making employee trip reduction requirements (USEPA, 1994, p.13).

There are certain federal actions listed in 40 CFR §93.153 (c)(2)(i-xxii) that would result in no emissions increase, or an increase in emissions that is clearly *de minimis*. These include but are not limited to continuing and recurring activities such as permit renewals where activities conducted will be similar in scope and operation to the activities currently being conducted, and rulemaking and policy development and issuance.

8.4 Emissions Criteria for Demonstrating General Conformity

To meet the conformity determination emissions criteria, the total of direct and indirect emissions from a federal action must meet all relevant requirements and milestones contained in the applicable SIP (40 CFR §93.158(c)), and must meet other specified requirements, such as:

- For any criteria pollutant or precursor, the total of direct and indirect emissions from the action must be specifically identified and accounted for in the applicable SIP's attainment or maintenance demonstration (40 CFR §93.158(a)(1)); or
- For precursors of ozone, nitrogen dioxide, or particulate matter, the total of direct and indirect emissions from the action must be fully offset within the same nonattainment (or maintenance) area through a revision to the applicable SIP or a similarly enforceable emissions control measure in the SIP (40 CFR §93.158(a)(2)).

The District does not anticipate that general conformity will be triggered during the maintenance plan through 2033.[38] If general conformity is triggered, the project would be required to reduce emissions to show that there is no emissions increase, or that those emissions are already accounted in the maintenance demonstration. No additional emissions will be included in the Second Maintenance Plan for projects that would trigger general conformity thresholds.

[38] The District contacted Sacramento Area Council of Governments (SACOG), Sacramento County Department of Airports and reviewed known land use projects to determine if there were any potential projects that would trigger the thresholds of 100 tons per year of PM_{10} or NO_X.

9. Summary and Conclusions

The second 10-year PM_{10} Maintenance Plan (referred to as Second MP) for Sacramento County shows continued maintenance of the PM_{10} 24-hour National Ambient Air Quality Standards (NAAQS) for a second 10-year period from 2024 through 2033. This is the second of two 10-year maintenance periods required by the Clean Air Act. The United States Environmental Protection Agency (EPA) approved the PM_{10} Implementation/ Maintenance Plan and Re-designation Request (referred to as First MP) for Sacramento County on September 26, 2013 (78 FR 59261), which became effective on October 28, 2013. The Second MP demonstrates how Sacramento County will maintain the 24-hour PM_{10} standard of 150 µg/m^3 for a second 10-year period, through 2033, by not having four or more exceedances days over a three-year period.

9.1 PM_{10} Air Quality Data and Trends

There are currently four PM_{10} monitoring sites within Sacramento County (represents the nonattainment area). Data collected since the 2000 attainment determination continues to show that Sacramento County meets the PM_{10} standard of 150 µg/m^3 except for exceedances that occurred in 2006 (one), 2018 (multiple) and 2019 (one) caused by either uncontrollable natural events or exceptional events. EPA's concurrence of the District's Exceptional Event Demonstration[39] would exclude all exceedances days in 2018, leaving one exceedance (on October 27, 2019) over the three-year period, 2017 – 2019. As a result of exclusion of this exceptional event data, the three-year average for the 2019 design value would be less than 1.0, which means that Sacramento County would continue to show attainment and maintenance of the PM_{10} standard.

Furthermore, the air quality trend from 1998 to 2019 shows the peak 24-hour PM_{10} concentrations have decreased and are expected to continue to decrease. Even though 2018 was an outlier year, the trendline shows that the PM_{10} concentrations will continue a downward trend, which indicates that Sacramento County is expected to show maintenance in the future.

The District also evaluated the 2020 air quality data for PM_{10} to determine if Sacramento would remain in attainment of the PM_{10} standard. Although the 24-hour PM_{10} concentrations on four days in 2020 exceeded the PM_{10} standard of 150 µg/m^3, these exceedances were suspected to be impacted by wildfire smoke.

9.2 Emissions Inventory

The emissions inventory is an account of pollutant emissions that estimates the amount of air pollutants emitted from many sources. The Second MP includes an emissions

39 The District's "Exceptional Event Demonstration for November 2018 PM_{10} Exceedances in Sacramento County Due to Wildfires" has been submitted to EPA for review and approval

inventory for total primary PM_{10} and Nitrogen Oxides (NO_X) as a PM_{10} precursor. The three largest categories of primary PM_{10} emissions are the area-wide sources for paved road dust, residential fuel combustion, and construction & demolition. The largest category of NO_X emissions is on-road mobile sources, which represents between 60% (2017 emissions inventory to 39% (2033 emissions inventory). Between 2017 (base year) and 2033 (attainment year):

- total NO_X emissions are projected to decrease by about 42% and total PM_{10} emissions are expected to increase by about 9%; and
- the combined inventory of PM_{10} and NO_X emissions are projected to decrease by about 17% from 69.49 tons per day down to 57.43 tons per day.

The combined emission inventory for PM_{10} and NO_X will decrease despite the increase in vehicle miles traveled and population in Sacramento County.

9.3 Control Measures

The District has already adopted and implemented PM ($PM_{2.5}$ and PM_{10}) and NO_X control measures to reduce emissions from fugitive dust, wood burning devices, and agricultural burning. Several emissions reduction programs have also been implemented by California Air Resources Board (CARB) to reduce directly emitted particulates and secondary PM precursor pollutants (NO_X and Sulfur Oxides (SO_X)) from mobile sources. These measures primarily address cleaner fuel specifications for diesel and reformulated gasoline, and mobile source engine emission standards that CARB has implemented statewide. No new control measure commitments are included in this plan since the existing control strategies are predicted to maintain the PM_{10} NAAQS throughout the second 10-year maintenance period of 2033.

9.4 Maintenance Demonstration

The proportional rollback analysis projected that future PM_{10} concentrations in Sacramento County will remain below the PM_{10} NAAQS of 150 $\mu g/m^3$ and that the region will continue to show maintenance. In the First MP, the proportional rollback analysis projected that ambient PM_{10} concentrations would decrease, which is consistent with what the observed ambient air quality concentration trends show through 2019.

The District will continue to operate an appropriate air quality monitoring network and review the assumptions and data for the PM_{10} maintenance demonstration to fulfill the verification and tracking requirements.

9.5 Contingency Plan

The contingency plan is expected to ensure prompt correction of any violation of the PM_{10} NAAQS. The Second MP identifies a specific indicator or trigger to determine when the contingency actions are activated for selecting, developing, and adopting the most appropriate control measures in an expedient timeframe. Any applicable emission reductions from already adopted rules that have not yet been implemented would be evaluated to determine if these new emission reductions would be sufficient to prevent future exceedances of the PM_{10} standard. These already adopted controls could include CARB and District $PM_{2.5}$ and NO_X measures to address ozone and $PM_{2.5}$ State Implementation Plan (SIP) requirements.

9.6 Transportation Conformity Budgets

Under the 1990 Clean Air Act Amendments, federal agencies may not approve or fund transportation plans and projects unless they are consistent with state air quality SIPs. The quantification and comparison of on-road motor vehicle emissions is the method for determining transportation conformity between air quality and transportation planning. The Second MP for Sacramento County includes transportation conformity budgets for 2024, 2027, and 2033 for PM_{10} and NO_X, a significant PM_{10} precursor. If the proposed motor vehicle emissions budgets (MVEB) are determined to be adequate and approved by EPA, SACOG must ensure that the aggregate transportation emissions do not exceed these motor vehicle emissions budgets in any future transportation plan amendment and updates.

9.7 Overall Conclusions

The Second MP demonstrates that Sacramento County will be able to continue to demonstrate maintenance for the 24-hour PM_{10} standard through 2033. It meets the provisions of CAA Section 175A(b) and includes an updated emission inventory, demonstrates maintenance of the PM_{10} standard, provides an updated control measure evaluation, and establishes new motor vehicle emission budget.

10. References

Bradley, M.A., Bowman J.L. and Griesenbeck B. "Development and application of the SACSIM activity-based model system." Berkeley, CA [2007.]

Calcagni, John. "PM-10 Moderate Area SIP Guidance: Final Staff Work Product". Air Quality Management Division, EPA, 2 April [1991.]

---. "Procedures for Processing Requests to Redesignate Areas to Attainment", Air Quality Management Division, Environmental Protection Agency, September 4, [1992.] p. 6, 9, 11-12.

California Department of Finance, "Historical Population Estimated for Cities, Counties, and the State". California Department of Finance, [2021a.] Web.16 August 2021 < https://www.dof.ca.gov/forecasting/demographics/estimates/ >.

---. "P-2A County Population Projections (2010-2060): Total Population for California and Counties" California Department of Finance, [2021b.] Web.16 August 2021. < https://www.dof.ca.gov/forecasting/demographics/projections/documents/P2A_County_Total.xlsx >

CARB. "California Surface Wind Climatology". Sacramento, CA: Aerometric Data Division, CA: California Air Resources Board [1994.] p. 13.

---. (2001) "Smoke Management Guidelines for Agricultural and Prescribed Burning," California Air Resources Board. California Code of Regulations, Title 17, Subchapter Z, Section 80100 et seq. 14 March 2001 Web. 24 March 2020. < http://www.arb.ca.gov/smp/regs/RevFinRegwTOC.pdf >

---. "EMFAC2017 - An update to California On-road Mobile Source Emission Inventory". Sacramento, CA: California Air Resources Board. 1 June [2017.] Print.

---. Miscellaneous Process Methodology 7.9 Entrained Road Travel, Paved Road Dust (Revised and Updated March 2018). Web 21 September 2020 < https://ww3.arb.ca.gov/ei/areasrc/fullpdf/full7-9_2018.pdf >

---. "EMFAC Off-Model Adjustment Factors to Account for the SAFE Vehicle Rule Part One". Sacramento, CA: California Air Resources Board. 20 November [2019.] Web. 24 August, 2020. < https://ww3.arb.ca.gov/msei/emfac_off_model_adjustment_factors_final_draft.pdf >

---. Section 7.1 Residential Wood Combustion Methodology (Revised October 2015). Web 21 September 2020 < https://ww3.arb.ca.gov/ei/areasrc/fullpdf/full7-1_2011.pdf >

---. CEPAM 2019: External Adjustment Reporting Tool - Version 1.02 Emission Projections by Summary Category Base Year: 2017. Web. 1 April [2021.] < https://www.arb.ca.gov/app/emsinv/2019ozsip/fcmasterdetail_sip2019.php >

European Environment Agency (EEA). "Emissions of air pollutants from transport" [2017] < https://www.eea.europa.eu/data-and-maps/indicators/transport-emissions-of-air-pollutants-8/transport-emissions-of-air-pollutants-8 >

Motallebi, Nehzat. "Wintertime $PM_{2.5}$ and PM_{10} Source Apportionment at Sacramento California." Air and Waste Management Association [1999.]

NCDC. "Local Climatological Data (LCD) | Data Tools | Climate Data Online (CDO) | National Climatic Data Center (NCDC) (noaa.gov)" Web 15 April 2021. website. < https://www.ncdc.noaa.gov/cdo-web/datatools/lcd >

SACOG. "2020 Metropolitan Transportation Plan/Sustainable Communities Strategy". Sacramento, CA: Sacramento Area Council of Governments. 18 November [2019.] Web. 23 March 2020. < https://www.sacog.org/sites/main/files/file-attachments/2020_mtp-scs.pdf?1580330993 >

---. "Re: PM10 budget data sheet 03262020.xlsx." Message from Renee Devere-Oki to Richard Muzzy. 6 April 2020. E-mail.

Sac Metro Air District "Report on Rule 421 – Mandatory Episodic Curtailment of Wood and Other Solid Fuel Burning Effectiveness." Sacramento, CA: Sacramento Metropolitan Air Quality Management District. 28 May, [2009.] Print.

---. "PM_{10} Implementation/Maintenance Plan and Redesignation Request for Sacramento County (with errata sheet incorporated)." Sacramento, CA: Sacramento Metropolitan Air Quality Management District, 28 October, [2010.] Print.

---. "Demonstration Of Reasonably Available Control Technology For The 2008 Ozone Naaqs (RACT SIP)" Sacramento, CA: Sacramento Metropolitan Air Quality Management District, 23 January, [2017.] Web 30 August 2021. < http://www.airquality.org/ProgramCoordination/Documents/RACT%20SIP%20RactSipReport%20032317%20Item%204.pdf >

---. "2020 Annual Air Monitoring Network Plan for Sacramento County". Sacramento, CA: Sacramento Metropolitan Air Quality Management District, [2020.] Print.

---. "Exceptional Event Demonstration for November 2018 PM_{10} Exceedance in Sacramento County due to Wildfires." Sacramento, CA: Sacramento Metropolitan Air Quality Management District, [2021.] Print.

SJVAPCD. 2007 PM10 Maintenance Plan and Request for Redesignation, Appendix F. Modeling Analysis. September 20, 2007, p. 60 – 98.

USEPA. “Air Quality System (AQS) | US EPA” Web. various dates. < https://www.epa.gov/aqs >

---. (52 FR 24634). “Revisions to the National Ambient Air Quality Standards for Particulate Matter”. Federal Register, Volume 52, July 1, 1987, p. 24634.

---. (58 FR 67334). “Designation of Areas for Air Quality Planning Purposes”. Federal Register, Volume 58, December 21, 1993, p. 67334.

---. (62 FR 38652). “National Ambient Air Quality Standards for Particulate Matter”. Federal Register, Volume 62, July 18, 1997, p. 38652-38760.

---. (67 FR 7082). “Clean Air Act Attainment Finding; Bullhead City and Payson Nonattainment Areas AZ; Sacramento and San Bernardino Nonattainment Areas, CA; Particulate Matter of 10 Microns or Less (PM-10)”. Federal Register, Volume 67, February 15, 2002, p. 7082-7085.

---. (71 FR 12468 – 12511). “$PM_{2.5}$ and PM_{10} Hot-Spot Analyses in Project-Level Transportation Conformity Determinations for the New $PM_{2.5}$ and Existing PM_{10} National Ambient Air Quality Standards,” Federal Register, Volume 71, March 10, 2006, p. 12468 - 12511.

---. (71 FR 61144). “National Ambient Air Quality Standards for Particulate Matter”. Federal Register, Volume 71, October 17, 2006, p. 61144-61233.

---. (75 FR 17254) “Revisions to the General Conformity”. Federal Register, Volume 75, April 5, 2010, p. 17254-17279.

---. (78 FR 3086), “National Ambient Air Quality Standards for Particulate Matter; Final Rule”. Federal Register, Volume 78, January 15, 2013, p. 3086-3287

---. (78 FR 59261), “Approval and Promulgation of Implementation Plans; Designation of Areas for Air Quality Planning Purposes; State of California; PM10; Redesignation of Sacramento to Attainment; Approval of PM10 Redesignation Request and Maintenance Plan for Sacramento”. Federal Register, Volume 78, September 26, 2013, p. 59261-59263.

---. (81 FR 68216). “Treatment of Data Influenced by Exceptional Events”, Federal Register, Volume 81, October 3, 2016, p. 68216-68282.

---. (84 FR 41717) Region 9. “Official Release of EMFAC2017 Motor Vehicle Emission Factor Model for Use in the State of California” Federal Register, Volume 84, August 15, 2019, p. 41717-41720. Print.

---. (85 FR 82684) “Review of the National Ambient Air Quality Standards for Particulate Matter”, Federal Register, Volume 85, December 18, 2020, p. 82684-82748. Print.

---. (85 FR 24174) Region 9. "Official Release of EMFAC2017 Motor Vehicle Emission Factor Model for Use in the State of California" Volume 85, April 30, 2020, p. 24174 - 24241.

---. General Conformity Guidance: Questions and Answers. United States Environmental Protection Agency Office of Air Quality Planning and Standard. 13 July [1994.] Print.

---. Network Design Criteria for Ambient Air Quality Monitoring. Title 40, Code of Federal Regulations Appendix D to Part 58 (2006.)

---. Interpretation of the National Ambient Air Quality Standards for Particulate Matter. Title 40, Code of Federal Regulations Appendix K to Part 50 (2006.)

---. 13.2.1 Paved Rods. United States Environmental Protection Agency Office of Air Quality Planning and Standard. January [2011.] Web. 30 August 2021. < https://www3.epa.gov/ttn/chief/ap42/ch13/final/c13s0201.pdf >

---. Subpart A - Conformity to State or Federal Implementation Plans of Transportation Plans, Programs, and Projects Developed, Funded or Approved Under Title 23 U.S.C. or the Federal Transit Laws, 40 CFR §93.100 – §93.129, Web 24 April 2021 < https://www.gpo.gov/fdsys/pkg/CFR-2013-title40-vol21/xml/CFR-2013-title40-vol21-part93.xml >

---. Subpart B – Determining Conformity of General Federal Actions to State or Federal Implementation Plans, 40 CFR §93.150 – §93.165, Web 24 April 2017 < https://www.gpo.gov/fdsys/pkg/CFR-2013-title40-vol21/xml/CFR-2013-title40-vol21-part93.xml >

---. Region 9 (2020), Letter to CARB. 3 March 2020. Print.

---. State implementation plan (SIP) or Tribal implementation plan (TIP) revision, 40 CFR § 51.851

Wang, Guihua. The role of light duty vehicles in future air pollution: a case study of Sacramento. Transportation Planning and Technology [2010] < https://escholarship.org/uc/item/2700q8x1 >

Weather. Climate for Sacramento California Web 15 September 2020 < http://www.rssweather.com/climate/California/Sacramento/ >

WRCC. Cooperative Climatological Data Summaries: NOAA Cooperative Stations – Temperature and Precipitation, WRCC: Coop Data Summaries (dri.edu) Web 8 April 2021. < https://wrcc.dri.edu/Climate/west_coop_summaries.php >

SECOND PM_{10} MAINTENANCE PLAN FOR SACRAMENTO COUNTY

Appendices

A. ANALYSIS OF PM_{10} EXCEEDANCE DAYS IN 2020

B. EMISSIONS INVENTORY

C. CONTROL MEASURES

Appendix A: Analysis of PM_{10} Exceedance Days in 2020

A.1 Overview

California experienced an unprecedented number of wildfires in 2020. Due to the favorable meteorological conditions for fires (lack of precipitation, low humidity, and gusty winds) and locations of the fires, some wildfires remained active for months. The smokes from these wildfires was transported into many areas, including Sacramento County. Consequently, the smoke from the wildfires resulted in four days in Sacramento County where the PM_{10} concentrations exceeded the 24-hour PM_{10} standard of 150 µg/m^3.

This Appendix reviews the 24-hour PM_{10} exceedances that were recorded at the monitoring stations in Sacramento County on September 8, 11, 12, and 13, 2020, and the active wildfires at that time. It includes discussions on:

- 2020 PM_{10} exceedances;
- Wildfires that occurred during that time period;
- Geographic extent of the smoke impacts;
- National Weather Service forecast discussions during the exceedance days;
- Satellite imagery and 24-HYSPLIT (Hybrid Single-Particle Lagrangian Integrated Trajectory) back trajectories;
- Wildfire smoke and health advisory, Sacramento Area tweets and local media reports; and
- Assessment of historic and auxiliary data that was used to determine the influence of smoke.

A.2 2020 PM_{10} Exceedances

Four days over a six-day period from September 8 to 13, 2020, recorded PM_{10} concentrations over the PM_{10} standard of 150 µg/m^3 at the monitoring stations in Sacramento County. Table A-1 shows the concentrations during the six-day period, and the concentrations above the PM_{10} standard are highlighted in gray. The exceedances occurred at the T-Street monitoring station on four of the six days during this period. All four monitors in Sacramento County showed exceedances of the standard on September 12, 2020. The concentrations on September 9 and 10 were elevated but did not exceed the standard.

From September 8 to 13, data from all monitors in Sacramento were flagged as IT (stands for “Wildfire-informational only qualifier”), which indicates the data may be impacted by wildfire. Dust from the high winds in addition to the wildfire smokes on September 8 could have also led to the highest 24-hour PM_{10} concentrations in 2020 of almost 300 µg/m^3 at T-Street monitoring station.

Table A-1 PM_{10} Concentrations at the Monitoring Stations

Date	Sacramento - T Street	Del Paso Manor (Site 1)	Del Paso Manor (Site 2)	North Highlands	Sacramento – Branch Center
Sampling Schedule	**Daily**	**1 in 6 days**	**1 in 6 days**	**1 in 6 days**	**1 in 6 days**
09/08/2020	298				
09/09/2020	121				
09/10/2020	115				
09/11/2020	231				
09/12/2020	186	186	188	187	201
09/13/2020	169				

Note: Samples collected at Sacramento-Branch Center, Del Paso Manor (Sites 1 and 2) and North Highlands are collected 1 in 6 days, so a single exceedance from one of these monitoring stations is equivalent to six exceedance days.
Concentrations were obtained from AQS database downloaded on March 27, 2021

A.3 Overview of Wildfires

Many wildfires, mostly in Northern California, were active from September 8 through 13 in 2020. An overview of the active wildfires during this six-day period is shown in Table A-2. Combined smoke from these fires created Unhealthy to Hazardous Air Quality Index (AQI) levels in Sacramento during this time period.

Table A-2 Summary of Wildfire Events

Fire Name	Start and containment Date	Counties	Comments
Slater/ Devils Fire (about 250 miles northwest of Sacramento)	September 7, 2020 November 16, 2020	Northern California (Siskiyou and Del Norte Counties) and Southern Oregon (Josephine County)	Fire burned over 166,000 acres. The Slater fire started on September 8 near the Slater Butte Fire Lookout on the Klamath National Forest and the Devil Fire was detected on September 9, north of Upper Devil's Peak on the Klamath National Forest. The cause of this fire is still under investigation. Severe fire weather conditions cause extreme fire behavior and caused the fire to overwhelm the community of Happy Camp destroying 197 residents and killing 2 people. Incident Information System Report: https://inciweb.nwcg.gov/incident/7173/
Red Salmon Complex Fire (about 100 miles northeast of Sacramento)	July 27, 2020 November 17, 2020	Klamath, Six Rivers, and Shasta-Trinity National Forests in Humboldt, Siskiyou, and Trinity Counties.	Fire burned about 145,000 acres and consisted of 2 fires, the Salmon Fire, and the Red Fire, which merged together. This fire was started in the Trinity Alps as a result of lightning strikes. On September 8 and 13, this fire was 20% contained. Incident Information System Report: https://inciweb.nwcg.gov/incident/6891/
August Complex Fire (about 100 miles northwest of Sacramento)	August 16, 2020 November 12, 2020	Includes Glen, Lake, Mend, Tehama, Trinity and Shasta Counties	Fire burned 1,032,648 acres. This fire originated as 38 separate fires started by lightning strikes in the Mendocino National Forest on August 16–17, 2020. Four of the largest fires, the Doe, Tatham, Glade, and Hull fires, had burned together by August 30. On September 9, the Doe Fire, the main fire of the August Complex, surpassed the 2018 Mendocino Complex to become both the single-largest wildfire and the largest fire complex fire. On September 8 and 13, this fire was 25% contained Incident Information System Report: https://inciweb.nwcg.gov/incident/6983/
North Complex Fire (Includes Baer and Claremont fires) (about 75 miles northeast of Sacramento)	August 17, 2020 November 30, 2020	Around Lake Oroville – Butte, Yuba and Plumas Counties	Fire burned 319,000 acres. The fires within the North Complex were ignited by a lightning strike. Fire suddenly grew on September 8 as a result of a wind event. Fire merged with another lightning-sparked fire near Quincy, it became known as the North Complex Fire. Incident Information System Report: https://inciweb.nwcg.gov/incident/6997/

Fork Fire (about 30 miles east of Sacramento)	September 8, 2020 November 9, 2020	El Dorado County	The fork fire was 1,673 acres and started in a remote mountain area of the Eldorado National Forest. The cause of this fire is still under investigation. This fire was driven by east winds gusting 30-50 miles per hour, the fire grew rapidly to the west. Incident Information System Report: https://inciweb.nwcg.gov/incident/7147/
Creek Fire (about 150 miles southeast of Sacramento)	September 4, 2020 December 24, 2020	Fresno County (Northeast of Shaver Lake)	Fire burned about 380,000 acres and is the fourth largest fire in California's history. The cause of this fire is still under investigation and the fire burned mostly in the Sierra National Forest. It started in the Big Creek Drainage Area. Fire destroyed more than 800 homes and businesses in both Fresno and Madera County mountains. Fire burned mostly in Sierra National Forest. On September 8 this fire was 0 % contained and on September 13 it was 6% contained. Incident Information System Report: https://inciweb.nwcg.gov/incident/7147/

Note: By September 8, 2020, the LNU Lightning Complex, which included multiple North Bay Counties was 91% contained (95% by September 11); the SCU Lightning complex, which included multiple East Bay Counties was 95% contained (98% by September 11); and the CZU August Lightning Complex, which included Santa Cruz and San Mateo Counties was 81% contained (85% contained by September 11)(Cal Fire, 2020). Hot spots did not appear on the satellite imagery from these fires.

The locations of these fires are displayed as red triangles[40] in proximity to Sacramento County in Figure A-1 (September 8, 2020) and Figure A-2 (September 13, 2020). The orange oval identifies the general locations of the monitoring stations in Sacramento County.

[40] The red triangles were identified as hot spot areas based on NOAA's Hazard Mapping System (HMS). Satellite imagery is used to detect hot spots and smoke plumes indicating possible fire locations (USEPA, 2020).

Figure A-1 Wildfires in Northern California on September 8, 2020

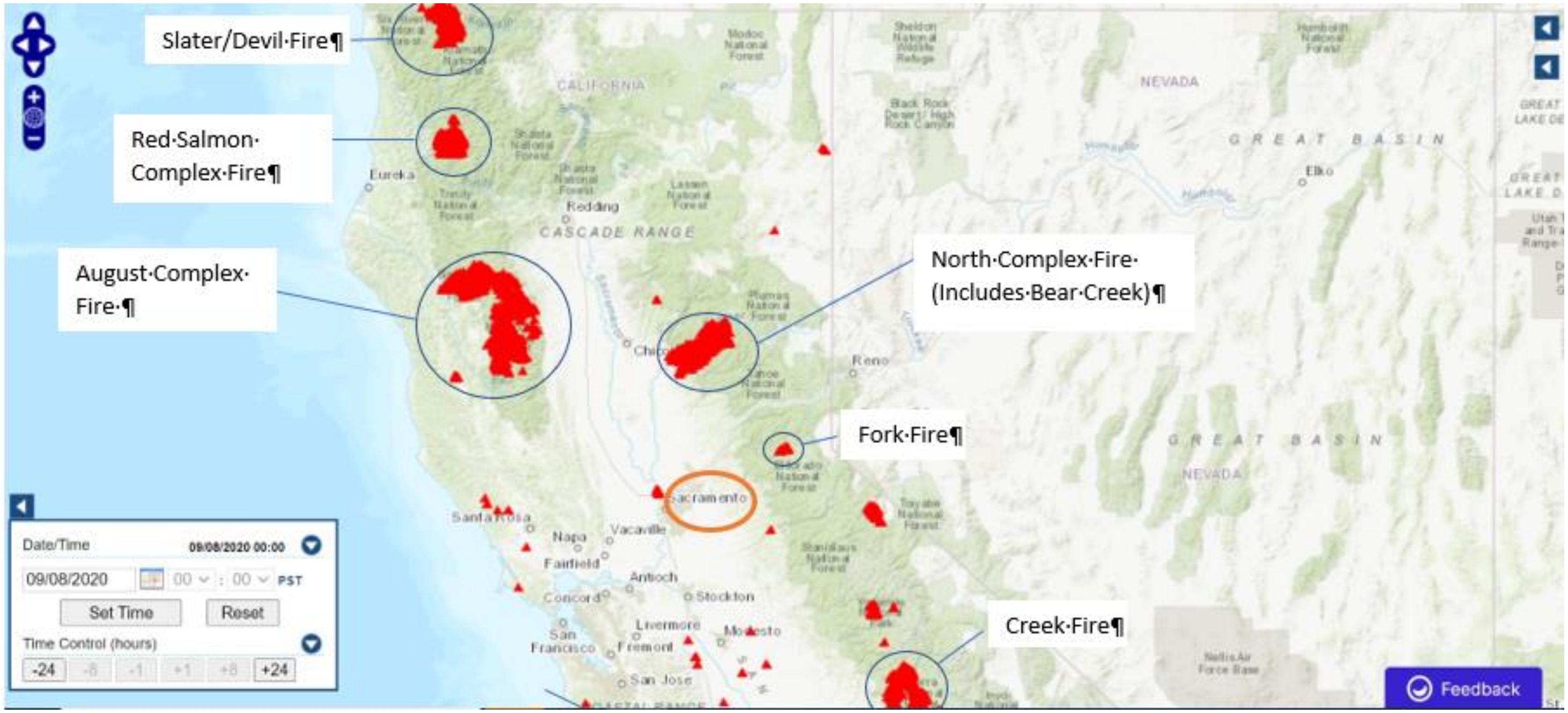
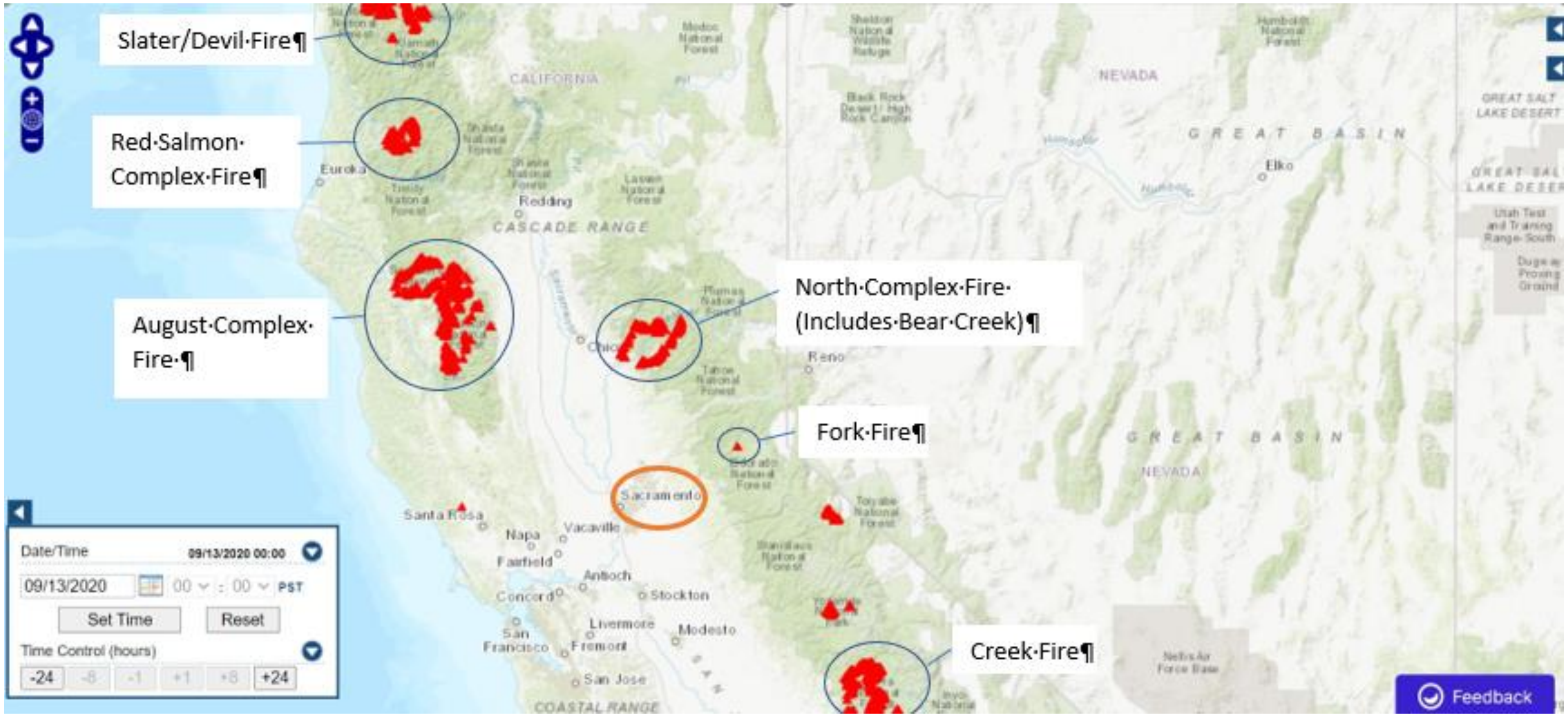


Figure A-2 Wildfires in Northern California on September 13, 2020



A.4 Not Reasonably Controllable and Not Reasonably Preventable

The fires shown on Table A-2 and Figures A-1 and A-2 were either a result of lightning strikes or are still under investigation. All these fires occurred primarily on National Forest Service lands. For example, the North Complex Wildfire was a result of dry thunderstorms, which sparked 21 wildfires in the Plumas National Forest and Lassen National Forest on August 17, 2020; the August Complex Wildfire originated as 38 separate fires started by lightning strikes in the Mendocino National Forest on August 16–17, 2020; the Red Salmon Complex started the morning of July 27, 2020, in the Trinity Alps Wilderness Area as a result of a lightning strike. The National Forest Service land is considered a wildland area, an area in which human activity and development are essentially non-existent, except for roads, railroads, power lines, and similar transportation facilities (Title 40 CFR § 50.1). These wildfires were natural events. The occurrence of these wildfires could not have been prevented and could not have been controlled, and there were no contributions of event related emissions from anthropogenic emissions.

A.5 Fire Progression and Smoke Impacts

Historic discussions from the National Weather Service (NWS) Area Forecast for Sacramento provided insights on the weather and air quality conditions during past events (National Weather Service, 2020). Table A-3 shows excerpts from the NWS Area Forecast morning (am) and afternoon (pm) discussions on September 8^{th} to the 13^{th} in 2020. The excerpts describe the strong winds, dry vegetation conditions, and low humidity, which produced critical fire conditions and caused the transport of heavy smoke into Sacramento County. At times, light winds and strong temperature inversions in Sacramento County forced the dense smoke plume to settle at ground level, causing poor visibility and hazardous particulate matter concentrations. There was also no precipitation to reduce smoke concentrations.

A.6 Sources and Transport of Emissions

To determine where the smoke was coming from into Sacramento, 24-hour HYSPLIT back trajectories from the T-Street monitoring station were done for the four days when the exceedances occurred. Satellite images, shown in Figures A-3(a-d) for September 8, 11, 12, and 13 in 2020, show that smoke was present in Sacramento County and that smoke to the Sacramento T-Street monitoring station and surrounding monitoring stations originated from the wildfires in the area. Figures A-3(a-d) show the 24-hour HYSPLIT backward trajectories and corresponding elevation profile for each exceedance date.

Table A-3 National Weather Service Forecasts for Exceedance Days

Date	Excerpts from National Weather Service Area Forecast Discussion (Issued by National Weather Service, Sacramento, CA)
09/08/2020	Gusty north to east winds continued this afternoon with strong surface pressure gradients. Northerly wind gusts of 30 to 45 mph have spread into the northern Sacramento Valley (am and pm). Wind gusts of 45 mph were reported at the Sacramento Executive Airport. The winds combined with very dry and record hot weather has caused critical fire weather conditions. Red flag warning was issued. Smoke and haze from wildfire will continue to impact air quality and temperatures (pm).
09/09/2020	Very dry air mass will remain in place with low relative humidity. There will also be increased southwest winds with fire weather concerns over next several days. Winds are especially strong around the Bear Fire (am). Huge amount of smoke present across most of Northern California this afternoon. Infrared imagery shows intense burning over portions of August Complex and Bear Fire (pm).
09/10/2020	Wildfire smoke continues throughout most of valley and smoke and haze are expected to impact area over next several days. Increased southerly winds are expected especially over the mountains. The Creek Wildfire is expected to bring smoke northward (pm).
09/11/2020	Widespread wildfire smoke is expected to impact air quality and temperatures. The smoke is much closer to the surface today for much of Northern California than the past few days creating hazardous air quality (am and pm). Any improvement in the thickness of smoke is expected to be slight. In three days, a trough of low pressure the winds will shift to the southwest moving smoke from the wildfires (pm).
09/12/2020	Satellite imagery shows upper level wildfire smoke is not as prevalent over Northern California, but smoke is still relatively thick near the surface (am). Air quality remains Unhealthy to Hazardous for most of area according to AirNow. High temperatures expected to remain in the upper 80s to low 90s (pm).
09/13/2020	South to southwest winds are expected to gust up to 20 to 25 mph (am). Satellite imagery is showing a stream of thick smoke moving through Northern California originating from the wildfires in Southern California. Smoke has caused the valley to be covered with smoke in the morning and in the later afternoon the smoke was starting to clear (pm).

Source: National Weather Service, 2020. National Weather Service Area Forecast Discussion. Sacramento, CA. Forecast Discussions for September 8 through 13, 2020

The HYSPLIT (NOAA, 2021a) backward trajectories show the movement of smoke over a 24-hour period towards the monitoring stations. The backward trajectories were initiated at three altitudes: 50 meters (green), 500 meters (blue) and 1,000 meters (red). These were the starting heights (from the T Street monitoring station), for the backward trajectory and these heights changed over the 24-hour trajectory as shown in the elevation profiles. Each of the three trajectory lines had five dots with the dot furthest away from the monitoring location representing the start of the 24-hour period and the dot at the monitor station representing the end of the of the 24-hour period. The trajectories started at 2 am on the date shown on the satellite image from T Street station and the furthest dot was at 2 am on the previous day. The date and time for the three dots between these two corresponded to the 6-hour interval of time between them (8 pm, 2 pm, and 8 am on the day preceding the date shown on the lower left corner of the satellite figure).

The 50, 500, and 1,000 meters height levels provided an indication of how the smoke was transported in the lower portion of the atmosphere. The initiating heights were chosen to provide insight into relevant vertical levels, which could impact surface air quality in Sacramento. An important measurement was the boundary layer height, which was crucial in determining ground-level smoke impacts. It was often characterized by a stable layer, which can trap pollutants such as smoke near the surface. Each point in these trajectories travels over the smoke plume. The 50 meters trajectories (shown in green) and elevation profiles in Figures A-3c and 3d clearly show that smoke within the lowest portion of the atmosphere was trapped and was transported directly to Sacramento. Figure A-3b also shows that a boundary layer caused the elevation profiles at 500 meters and 1,000 meters to go back down after initially going up.

These figures show that smoke continued to be thick, which caused concentrations to drive up the 24-hr averages and exceeded the standard. Air quality concentrations on September 9 and 10, as shown in Table A-1, in Sacramento County were not elevated or prolonged enough to exceed the standard.

Figure A-3(a-d) HYSPLIT Backward Trajectories for the Exceedance Dates

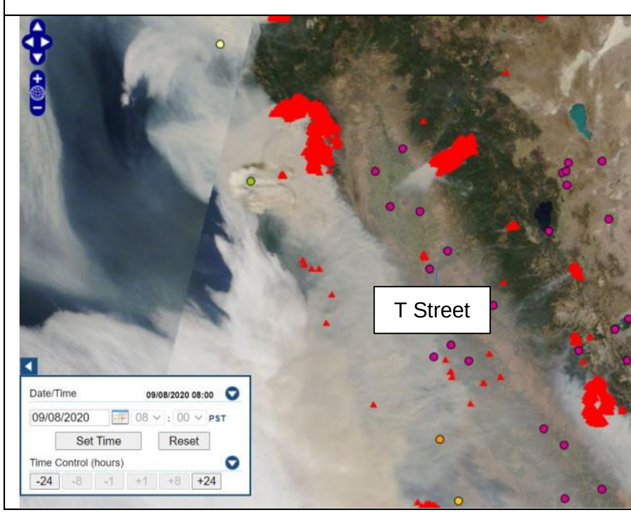
<table>
<tr><td colspan="2">Figure A-3a (September 8, 2020)</td></tr>
<tr><td>
</td><td>The HYSPLIT Trajectories from this date are not available for the North American Mesoscale Model (NAM) 40-km projection system. This projection system was used for the September 11 – 13.</td></tr>
</table>

Figure A-3b (September 11, 2020)

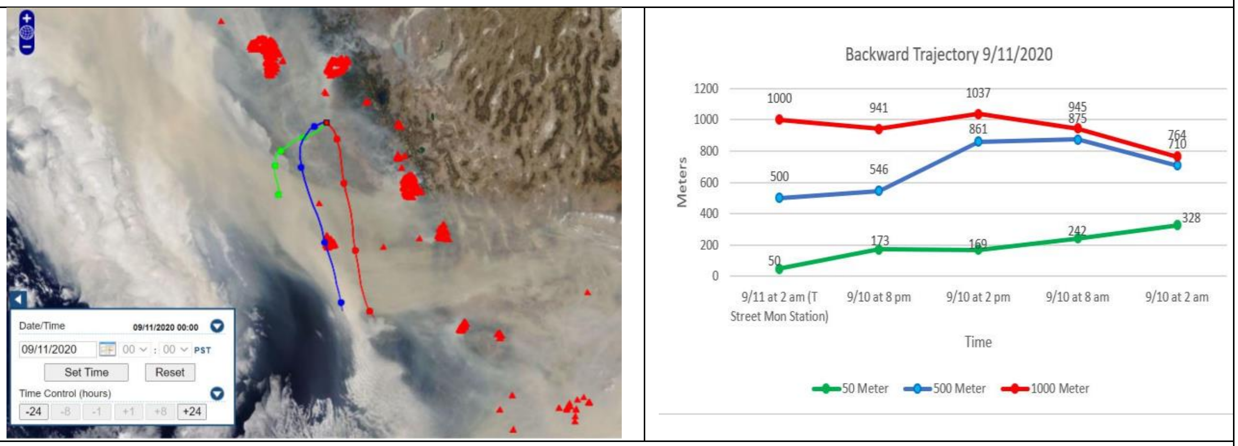


Figure A-3c (September 12, 2020)

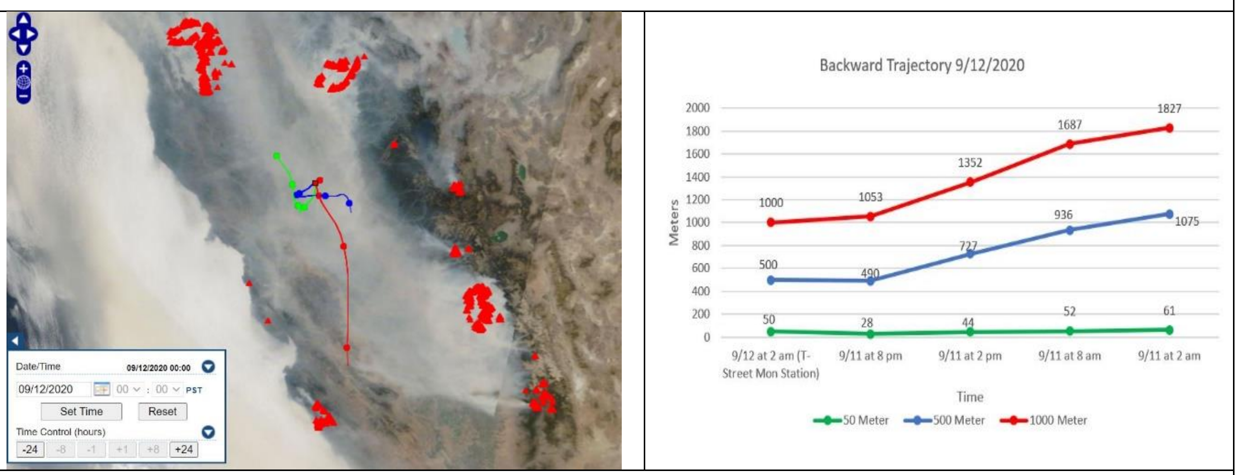
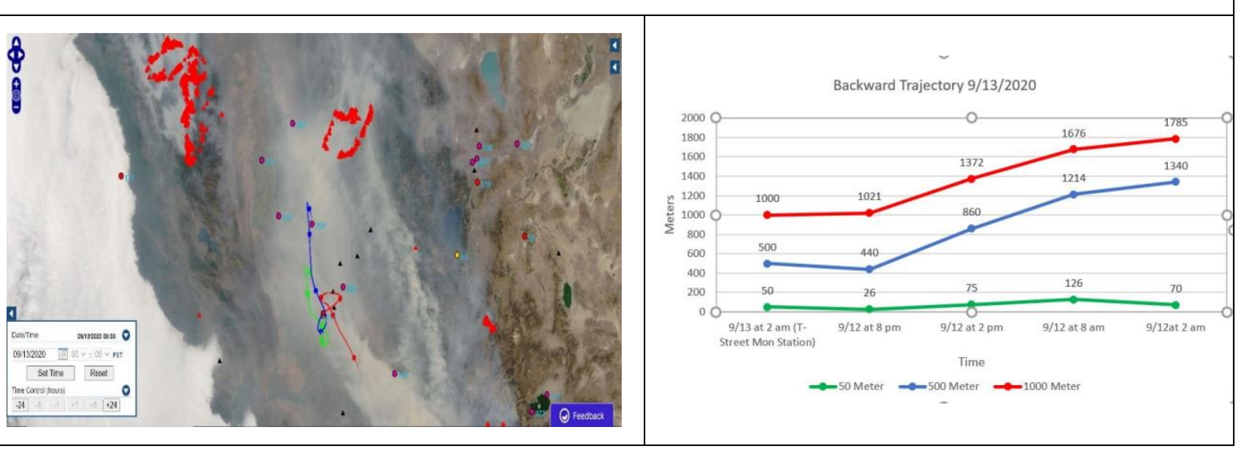


Figure A-3d (September 13, 2020)

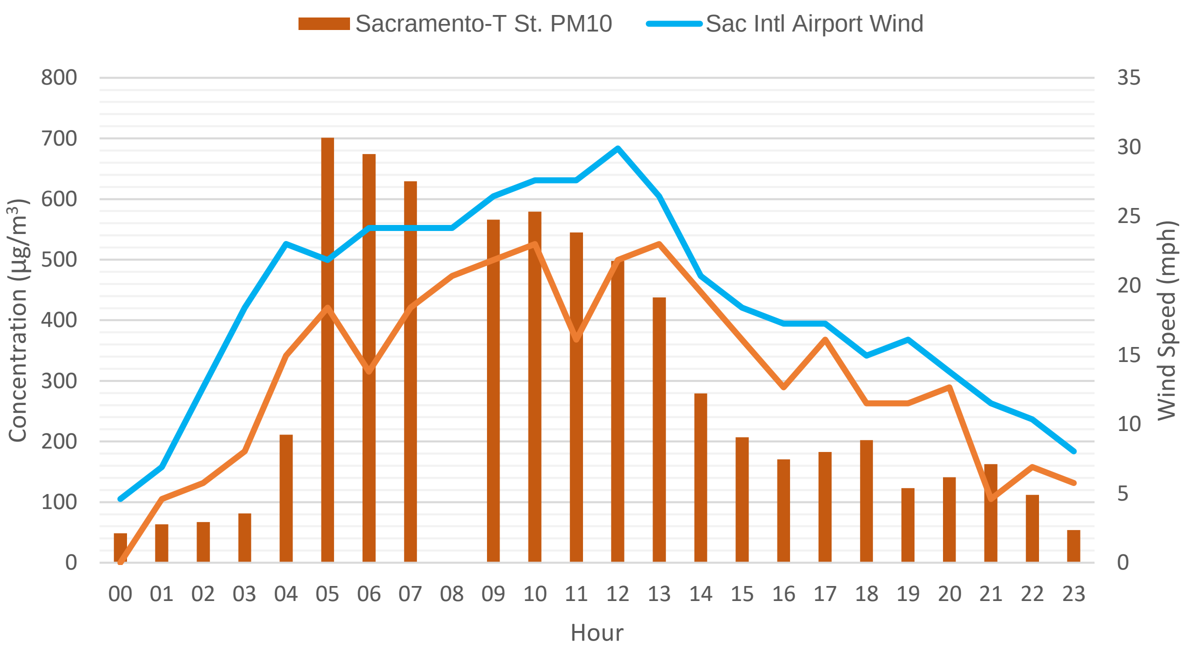


Source: NOAA. "Air Resources Laboratory - HYSPLIT - Hybrid Single Particle Lagrangian Integrated Trajectory model (noaa.gov)". National Oceanic and Atmospheric Administration. Air Resource Laboratory. Web. 30 April 2021a.

A.7 Analysis of Wind Speeds and Hourly PM_{10} Concentrations – September 8, 2020

High winds on September 8, 2020 are suspected to have transported dust and smoke into Sacramento County and contributed to the high 24-hour PM_{10} concentrations of close to 300 µg/m^3. The high wind gusts were discussed in Table A-3 (see discussion under 09/08/21), and Figure A-4 shows that high hourly PM_{10} concentrations also correlated with high hourly wind speeds from Sacramento Executive Airport and Sacramento International Airport (NOAA, 2021b)[41]. The hourly PM_{10} concentrations between the hours of 06 and 13 were more than 400 µg/m^3, and these high concentrations were recorded during the highest wind speeds for the day.

Figure A-4 Hourly PM_{10} Concentrations at Sacramento T-Street and Wind Speed on September 8, 2020



Note: Concentrations were obtained from AQS database downloaded on April 30, 2021.

A.8 Geographic Extent of Wildfires

This section describes the extent of the smoke impact from the wildfires. Although this analysis focuses on the exceedances of the PM_{10} standard at the monitors within Sacramento County, there were exceedances of the standard outside of the county, which showed the extent of wildfire smoke impacts around the region.

41 Historical meteorological data is extracted from National Climatic Data Center's Local Climatological Data (LCD) website. < https://www.ncdc.noaa.gov/cdo-web/datatools/lcd >

Table A-4 show the wildfires daily geographic extent of smoke impacts on PM_{10} concentrations from September 7 through September 15, 2020, from the north, south, east and west of Sacramento. On September 7, 2020, the PM_{10} concentrations were between 50 to 100 µg/m^3 in Sacramento and the nearby surrounding communities. When more fires ignited and with north/northeast wind gusts on September 8, 2020, smoke was transported into the region, and PM_{10} concentrations increased significantly throughout the region, including in Sacramento County. The monitoring data shows that PM_{10} concentrations on September 8, 2020, increased by as much as 6 times the concentrations on the previous day. On September 11 through 13, 2020, the monitoring stations in Sacramento County recorded exceedances along with the monitoring stations outside of the area. After the last exceedance was recorded in Sacramento County on September 13, 2020, PM_{10} concentrations gradually started to go down until they were back down between 50 to 100 µg/m^3 in Sacramento and nearby surrounding counties.

Table A-4 Geographic Extent Impacts from Wildfires from September 7 to 15, 2020

Date	Sacramento/ Location Area (Fig A-5, Monitor 11)	PM_{10} 24-hour Concentrations at Monitoring Stations Relative to Sacramento (µg/m^3)			
		North/Location Area (Fig A-5, Monitor 18)	South/Location Area (Fig A-5, Monitor 15)	North East/Location Area (Fig A-5, Monitor 8)	West/Location Area (Fig A-5, Monitor 19)
09/07/2020	T-Street: 66	Yuba City: 60	Manteca: 67	Roseville: 34	No Data
09/08/2020	T-Street: 298	Yuba City: 194	Manteca: 335	Roseville: 251	No Data
09/09/2020	T-Street: 121	Yuba City: 105	Manteca: 142	Roseville: 124	No Data
09/10/2020	T-Street: 115	Yuba City: 146	Manteca: 132	Roseville: 123	No Data
09/11/2020	T-Street: 231	Yuba City: 174	Manteca: 226	Roseville: 213	No Data
09/12/2020	T-Street: 186	Yuba City: 246	Manteca: 206	Roseville: 177	Woodland: 223
09/13/2020	T-Street: 169	Yuba City: 268	Manteca: 163	Roseville: 200	No Data
09/14/2020	T-Street: 121	Yuba City: 113	Manteca: 145	Roseville: 120	No Data
09/15/2020	T-Street: 56	Yuba City: 98	Manteca: 74	Roseville: 79	No Data

Concentrations Shading (this shading does not correspond to Air Quality Index values)

- 0 to 50 µg/m^3
- 51 to 100 µg/m^3
- 101 to 150 µg/m^3
- >151 µg/m^3

Note: Concentrations were obtained from AQS database downloaded on April 15, 2021.

Figure A-5 Nearby PM_{10} Monitors

A.9 Wildfire Smoke and Health Advisory

The Sac Metro Air District in coordination with Sacramento County Public Health Office issues air quality health advisories when there are poor air quality events, like wildfire smoke, that impact the health of Sacramento County residents. On September 9, 2020, a health advisory was issued that included a brief discussion on the high PM_{10} concentrations due to dust and smoke impacts that occurred the day before on September 8, 2020, and the continued smoke impacts on and after September 9, 2020. The advisory also provided guidance on what to do when Sacramento residents smell smoke.

Figure A-6 Wildfire Smoke and Health Advisory from September 9, 2020 (Sacramento County et al, 2020)

SACRAMENTO COUNTY

SACRAMENTO METROPOLITAN AIR QUALITY MANAGEMENT DISTRICT

Date: September 9, 2020

Contacts: Brenda Bongiorno (916) 874-7798 (Health questions)
Jamie Arno (916) 874-4888 (Air quality questions)

Coarse Particles Episode Expected to Subside, but
Wildfire Smoke Pollution Will Continue to Impact Region

Yesterday, strong, dry northerly winds blew a combination of dust and wildfire smoke into the Sacramento region, resulting in unhealthy levels of PM10 coarse particulate matter and PM2.5 fine particulate matter. The spike in PM10 concentrations were recorded at monitors in the region. This combination of particulate matter caused the thick, brown, haze that persisted throughout the day and this morning at ground-level. Although the continuous PM10 monitor in Sacramento County reflected extremely high levels of pollution, others monitoring PM2.5 did not show unhealthy levels at some points during the episode. Since the strong north winds have calmed, PM10 levels are forecasted to drop gradually in the days to come.

However, smoke will continue to impact Sacramento County from the North Complex fires burning in Plumas County. Smoke most likely will hover high above in the morning hours but will mix down towards ground level in the afternoon and evenings. Therefore, air quality monitoring readings may reflect moderate levels of PM2.5 in the morning and elevated levels later in the day.

Due to variable and changing wind conditions, the Sacramento region will continue to experience on-and-off smoke impacts while wildfires are burning throughout Northern California. Sacramento County is expected to reach PM2.5 levels ranging from Unhealthy for Sensitive Groups (orange) to Unhealthy (red) or higher categories on the Air Quality Index the next few days.

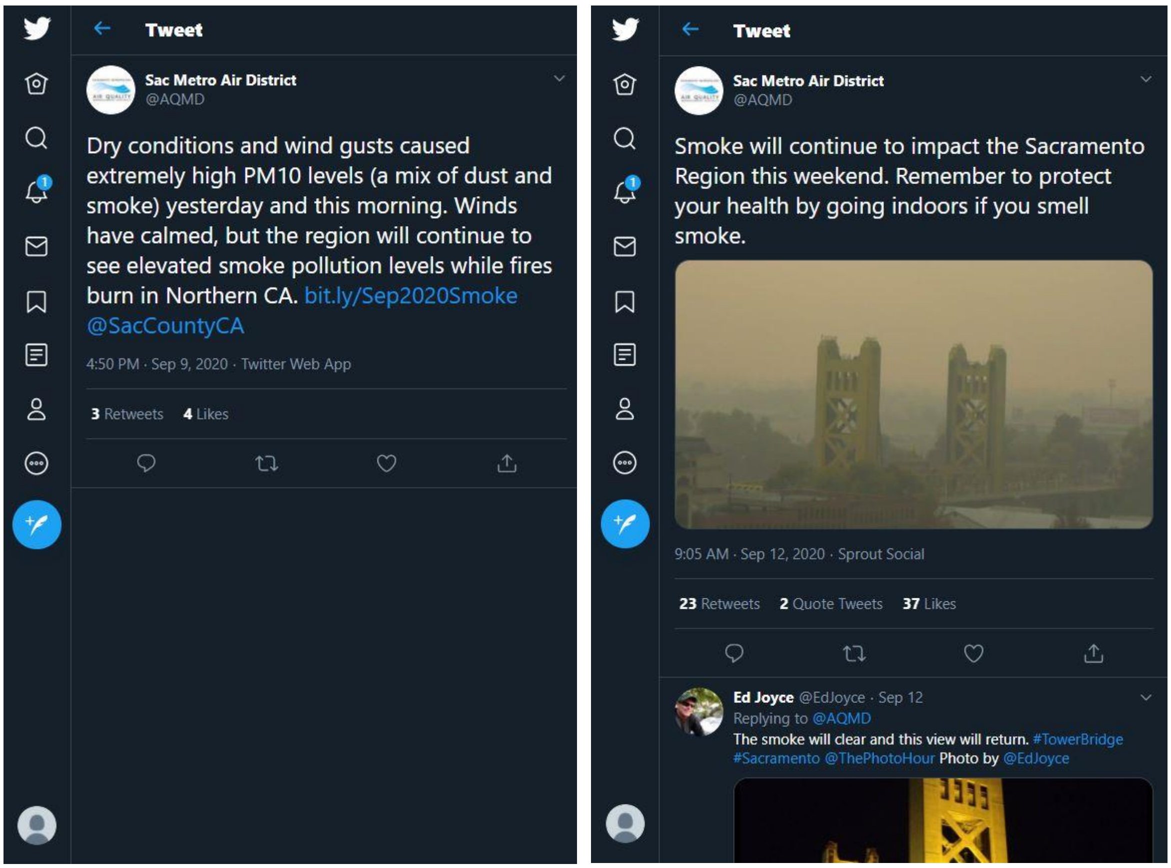
The Sacramento Metropolitan Air Quality Management District, in conjunction with Sacramento County Public Health, is **advising residents to continue stay indoors if they smell smoke, as this is the most effective way to reduce exposure.**

For wildfire smoke information visit the Sac Metro Air District website at AirQuality.org or download the Sacramento Region Air Quality app for real-time readings. Additional real-time information can be found at fire.airnow.gov.

A.10 Sac Metro Air District Tweets

To help inform the public of the smoke impacts in Sacramento between September 9 and 12, 2020, the Sac Metro Air District sent out tweets that described the conditions in Sacramento, including the elevated particulate matter ($PM_{2.5}$ and PM_{10}) levels. Figure A-7 shows tweets that were issued on September 9 and September 12, 2020 (Sac Metro Air District, 2020).

Figure A-7 Sac Metro Air District Tweets



A.11 Media Reports

Between September 8 and 13, 2020, the media covered the wildfire smoke impacts in Sacramento. The following excerpts from newspaper articles and news media reports described the smoke and air quality impacts that resulted from the active wildfires at that time (discussed in Table A-2). The articles also described the meteorological conditions, which caused the wildfires to spread rapidly and the smoke to become unhealthy in the Sacramento area.

A.11.1 Air Quality reaches hazardous levels in Sacramento. It's not just from wildfires.

By Molly Burke and Michael McGough, Sacramento Bee (September 8, 2020)

"Air quality in the Sacramento area reached hazardous levels Tuesday morning, with one air quality index measurement of 484 raising an alarm for anyone who checks those numbers regularly. A reading over 50 is considered moderately unhealthy; anything over 300 is considered hazardous."

"Northwesterly winds are bringing smoke and particles into the Sacramento Valley from various wildfires across Northern California. The gusts will increase vertical mixing and pollutant dispersion."

"While smoke remains a concern and can produce elevated pollutant levels, the primary pollutant in the air is dust blown by the wind, according to air officials. Gusts near Sacramento are forecast to hit as high as 34 mph Tuesday afternoon and evening."

A.11.2 Northern California braces for strong winds and high fire risk Tuesday, Wednesday

By Rob Carlmark, ABC10 News (September 8, 2020)

SACRAMENTO, Calif. — "After one of the most intense heat waves ever recorded for Northern California in September, the region will see rapid weather changes. Strong winds are moving in Tuesday (September 8, 2020) with strong gusts in the valley up to 30 mph and 50 mph for the Sierra. The air will also be warm and very dry with relative humidity in the single digits at times. Fires will grow very quickly in these conditions and a Red Flag Warning has been issued for almost all Northern California except for the immediate coastal areas. Winds will be strong in general in the valley with blowing dust and sustained wind in the 25 mph range. Light objects should be secured."

A.11.3 Sacramento air quality reaches 'very unhealthy' level but conditions could change Sunday

By Molly Burke and Michael McGough, Sacramento Bee ((September 11, 2020 (10:39 AM and updated September 12, 2020 (2:47 PM))

"The Sacramento Metropolitan Air Quality Management District issued an air alert Saturday, advising residents to avoid prolonged or heavy exertion outdoors. The primary pollutant currently darkening the California sky is

$PM_{2.5}$, which is considered typical of wildfire smoke, officials said. Earlier in the week, the National Weather Service in the Bay Area reported that large chunks of ash, with a size greater than PM_{10}, exceeded the measuring capacity of its sensors, making it difficult to accurately assess air quality dangers."

"The Interagency Wildland Fire Air Quality Response Program said the August Complex, which became the largest wildfire in California history, and many other wildfires across Northern and Central California continue to bring smoke into the region. With plentiful dry fuels, smoke and extreme fire conditions are continuing."

"The agency also said earlier this week that smoke that hanging in upper levels of the atmosphere was descending to the ground level, where air quality monitors are located, which helped to explain the worsening air quality in the region."

A.12 Comparison of Event Related Concentrations to Historical Concentrations

PM_{10} concentrations measured during the month of September 2020 were compared to historical data for the same month in 2015 through 2019 as shown in Figures A-8(a-e). The comparison was done for all PM_{10} monitors in Sacramento County. In the figures, the dates between September 8 and 13 are highlighted, which includes the four dates (September 8, 11, 12, and 13) when the exceedances were recorded in 2020. These figures show that 2020 concentrations (shown as black triangles) in the highlighted area are significantly higher than the concentrations for 2015 through 2019. At the Sacramento T-Street monitoring site (Figure A-8a), the 24-hour PM_{10} concentrations were at least 3 times higher than the average concentrations from 2015 through 2019 for each exceedance day. Figures A-8(a-d) show that the only concentrations that exceeded the PM_{10} standard of 150 $\mu g/m^3$ were in 2020.

Figure A-8(a-e) PM_{10} 24-hour Concentrations from 2015 - 2020 during September at various in Sacramento County

Figure A-8a PM_{10} 24-hour Concentrations from 2015 - 2020 during September at Sacramento T – Street

Note: Concentrations were obtained from AQS database downloaded on April 13, 2021.

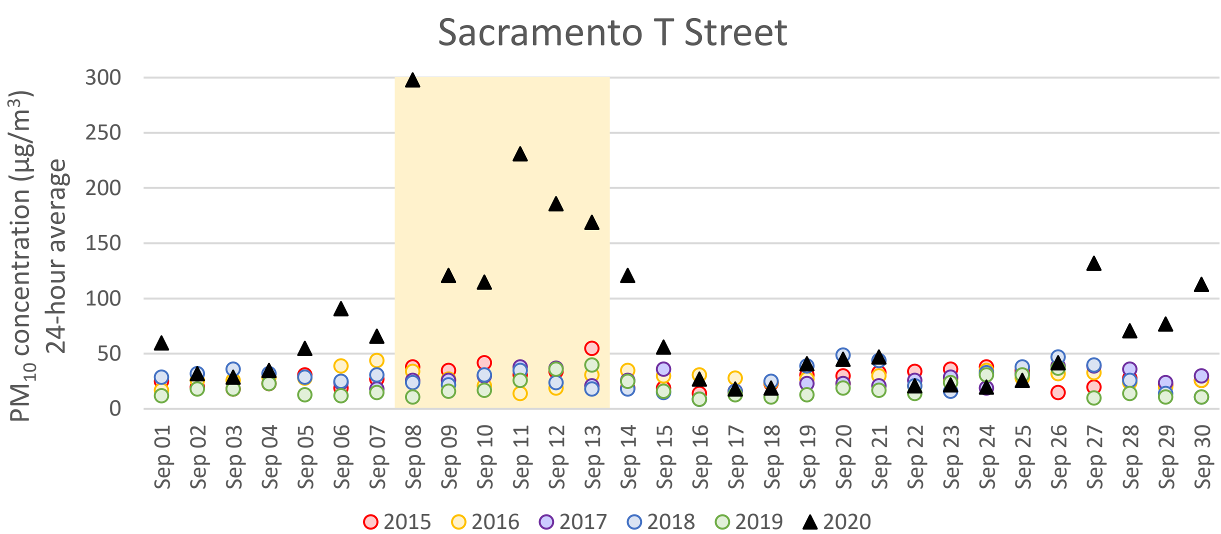


Figure A-8b PM_{10} 24-hour Concentrations from 2015 - 2020 during September at Del Paso Manor-1

Note: Concentrations were obtained from AQS database downloaded on April 13, 2021.

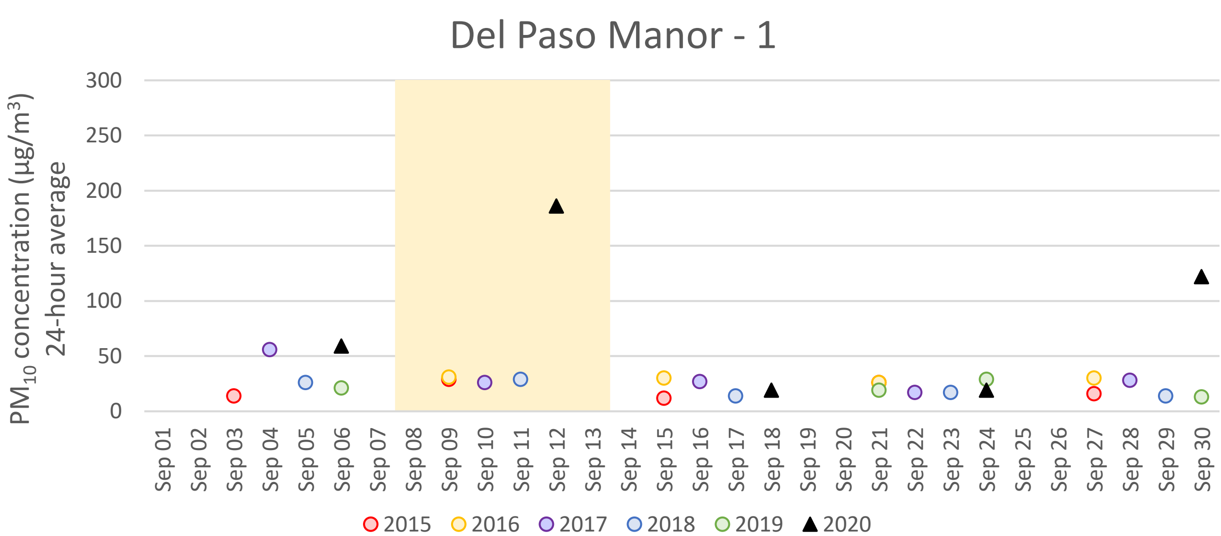


Figure A-8c PM_{10} 24-hour Concentrations from 2015 - 2020 during September at Del Paso Manor-2

Note: Concentrations were obtained from AQS database downloaded on April 13, 2021.

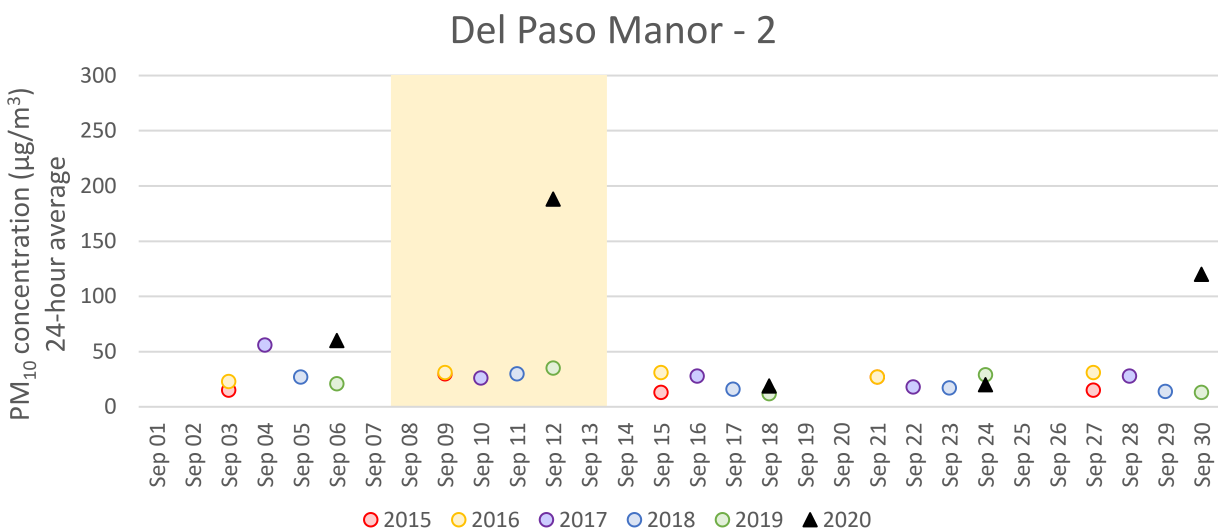


Figure A-8d PM_{10} 24-hour Concentrations from 2015 - 2020 during September at Branch Center

Note: Concentrations were obtained from AQS database downloaded on April 13, 2021.

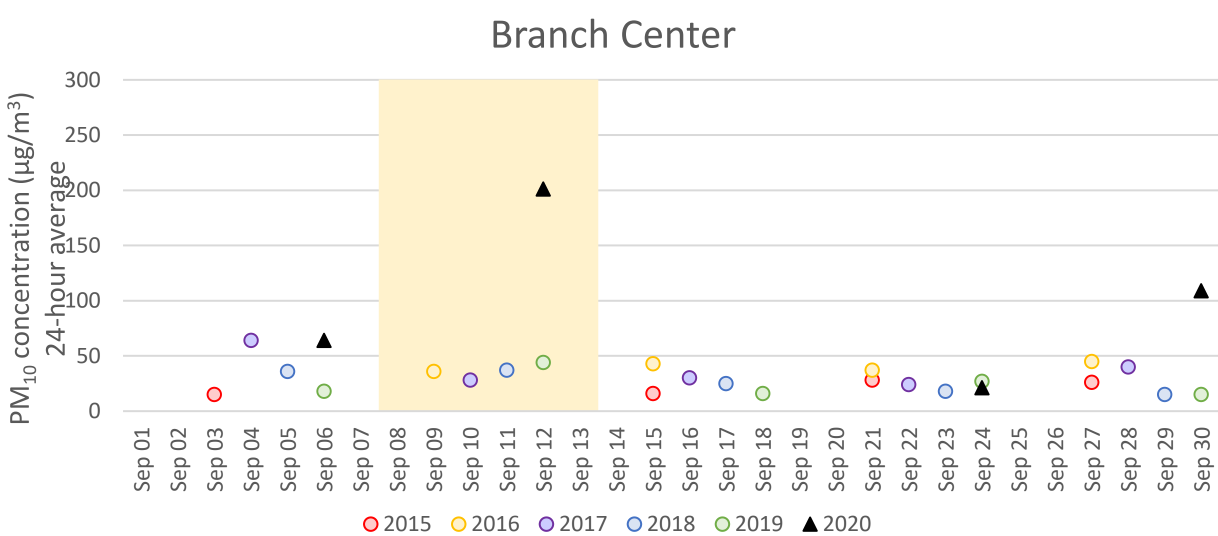
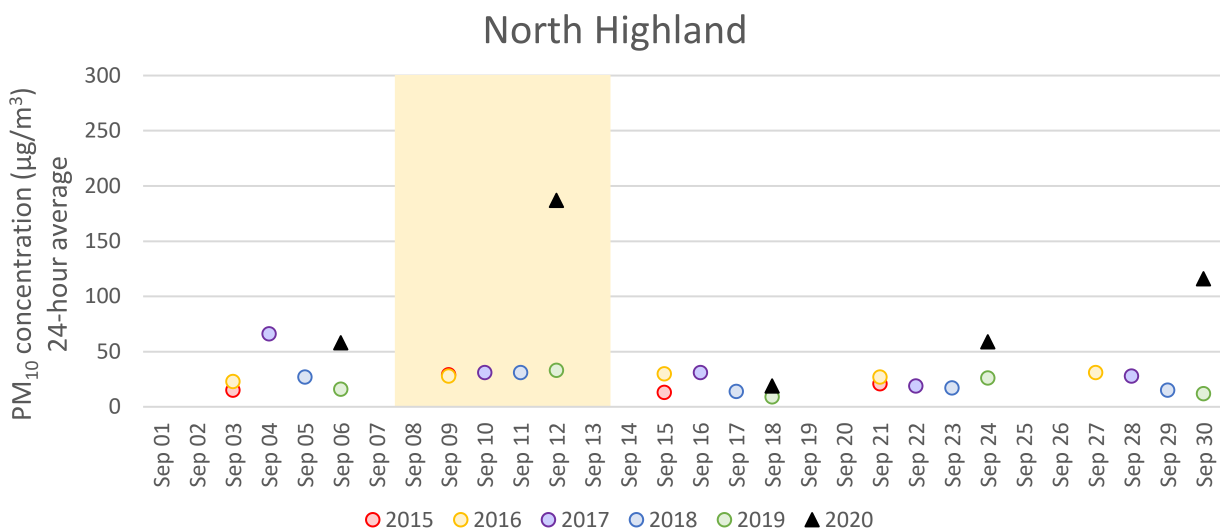


Figure A-8e PM_{10} 24-hour Concentrations from 2015 - 2020 during September at North Highland

Note: Concentrations were obtained from AQS database downloaded on April 13, 2021.



A.13 Chemical Composition and Size Distributions

Smoke from wildfire is composed of many compounds, including carbon dioxide**,** water vapor**,** carbon monoxide**,** particulate matter**,** hydrocarbons and other organic chemicals, and nitrogen oxides. The actual composition of smoke depends on the fuel type, the temperature of the fire, and the wind conditions (USEPA, 2019).

During wildfire events, smoke will increase the $PM_{2.5}$ concentrations along with PM_{10} concentrations. Figures A-9a and A-9b compare the $PM_{2.5}$ concentrations in September 2020 to historical data for the same month in 2015 through 2019. The dates between September 8 and 13 are highlighted because this range includes the four dates (September 8, 11, 12, and 13) when the exceedance days were recorded in 2020. These figures show that 2020 concentrations (shown as black triangles) in the highlighted area are significantly higher than the concentrations for 2015 through 2019. The concentrations on September 8, 11, 12 and 13 were close to 5 times higher than historic concentrations from 2015 through 2019 on those days.

The high $PM_{2.5}$ concentrations are not suspected to be significantly attributed to emissions from localized sources like residential wood burning, which typically occurs during the winter months (November through February) in Sacramento. The concentrations correlate with a large presence of smoke in the air, and it is believed that the main source of $PM_{2.5}$ emissions was from the wildfires discussed in Table A-2.

Figure A-9(a-b) $PM_{2.5}$ concentrations during September 2015 – 2020

Figure A-9a**.** $PM_{2.5}$ concentrations during September 2015 – 2020 at Del Paso Manor

Note: Concentrations were obtained from AQS database downloaded on April 13, 2021.

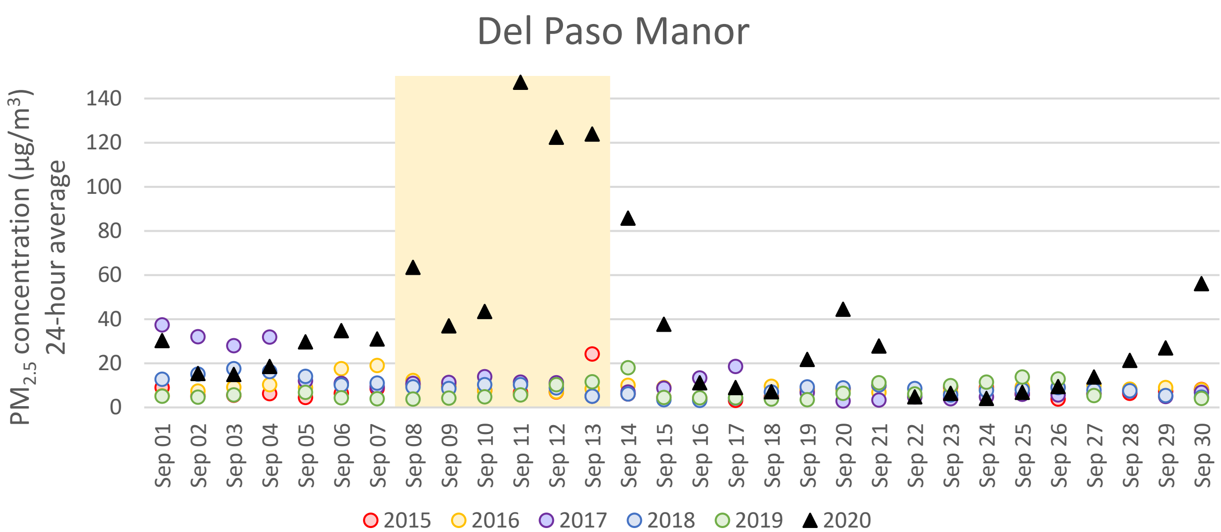
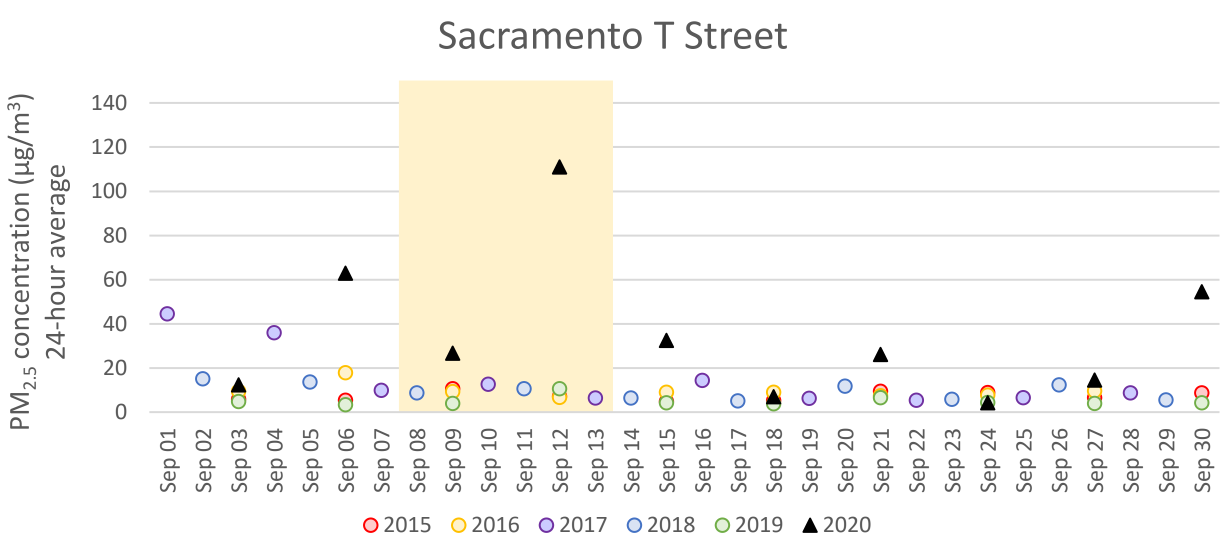


Figure A-9b**.** $PM_{2.5}$ concentrations during November 2015 – 2019 at T Street (Regulatory Monitor)

Note: Concentrations were obtained from AQS database downloaded on April 13, 2021.



A.14 Assessment of Auxiliary Air Quality Data

Emissions from wildfires include carbon monoxide (CO), black carbon (BC), and organic carbon (OC). Of the four air monitoring sites that monitor for PM_{10}, one site, Del Paso Manor, also monitors for CO, BC and OC.

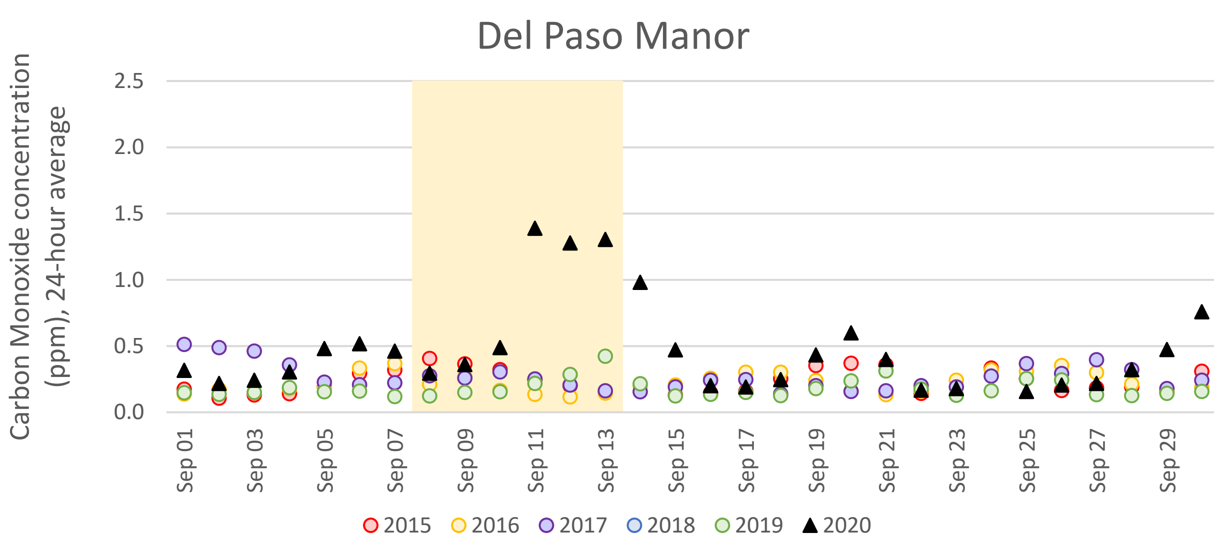
Figure A-10a shows CO concentrations at Del Paso Manor monitoring site during September from 2015 through 2020. Highlighted are concentrations from September 8 through 13. The highest CO concentrations were in 2020, which are shown as black triangles. Concentrations on September 11, 12, and 13 were about 3 times higher than the concentrations in 2015 through 2019. Concentrations of CO on September 8, 2020 were consistent with concentrations in 2015 through 2019, which possibly could indicate a higher amount of dust in the air and less smoke.

On Figures A-10a and 10b, September 8 through 13 are highlighted because four (September 8, 11, 12, and 13) out of the six days were the PM_{10} exceedance days in 2020. Figure A-10b shows BC concentrations at Del Paso Manor monitoring site during September from 2015 through 2020. The highest BC concentrations recorded during the period from September 8 through 13 were in 2020 from September 11 through 13. The black carbon concentration was not as high on September 8 when compared to the concentrations on September 11 through 13, which indicates that the high PM_{10} concentration on September 8 may be mostly attributed to the high wind dust event. In addition to the BC data, the OC from speciated $PM_{2.5}$ data is shown from Del Paso Manor monitoring in Figure A-10c. Like BC, the highest OC concentrations were recorded during the wildfires in September 2020. The BC and OC concentrations were elevated throughout the period of the event and tapered off as the smoke dissipated from the region.

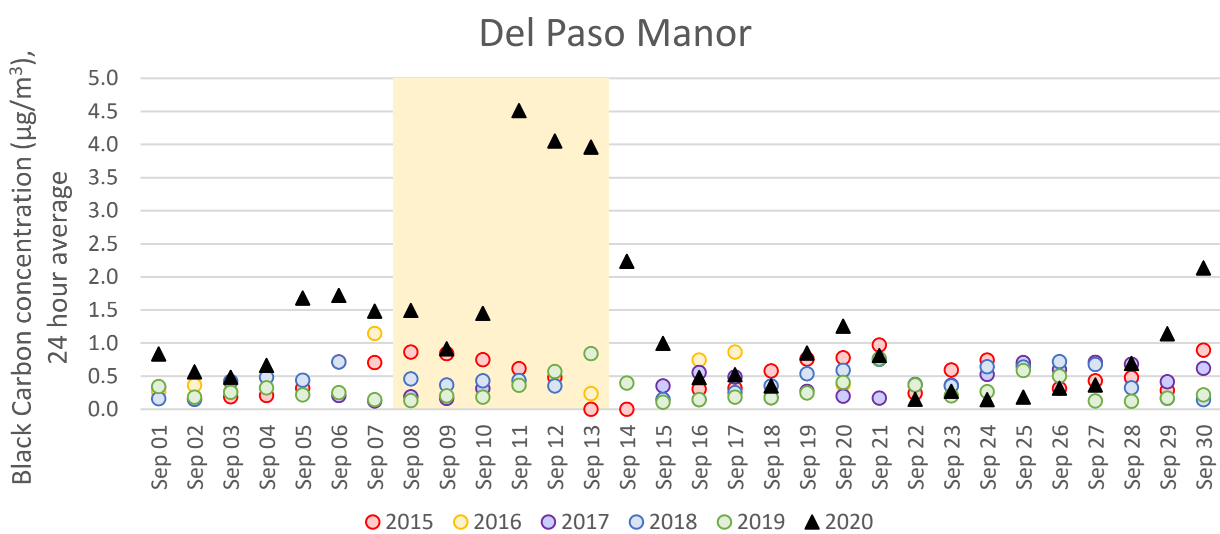
Figure A-10(a-c) CO, BC, and OC concentrations during September 2015 – 2020

Note: Concentrations were obtained from AQS database downloaded on April 13, 2021. Units are in parts per million (ppm)

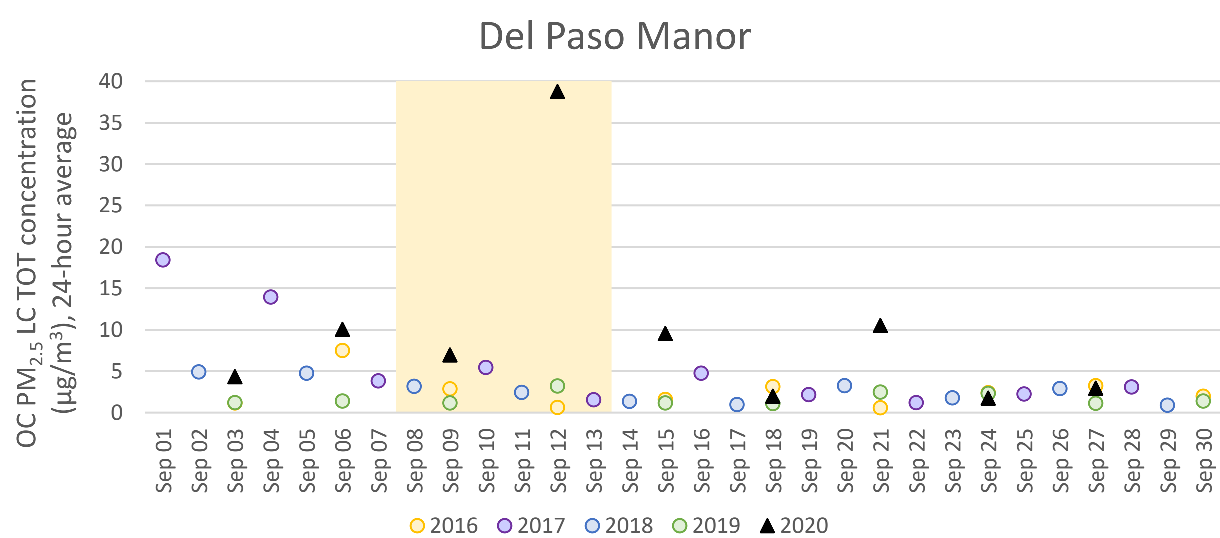
a. Carbon Monoxide concentrations at Del Paso Manor



b. Black carbon concentrations at Del Paso Manor



c. Organic carbon* concentrations at Del Paso Manor



* Organic carbon data is from Chemical Speciation Network data operating on a 1 in 3-day schedule.

A.15 Conclusion

From September 8 through 13 in 2020, several large wildfires burned throughout California. Most of these wildfires occurred predominately on wildlands on national forests and were a result of lightning strikes. These fires quickly spread due to dry conditions, hot weather, low humidity and a lack of precipitation. Gusty winds caused the smoke from these wildfires to be transported throughout the region, including into Sacramento County.

The smoke from these wildfires caused 24-hour PM_{10} concentrations in Sacramento County to be above the PM_{10} standard of 150 µg/m^3 on September 8, 11, 12, and 13 in 2020. The monitored 24-hour PM_{10} concentrations during these four days were 4 to 5 times higher than the PM_{10} concentrations from September 2015 through 2019. Satellite imageries and 24-hour HYSPLIT backward trajectories show that numerous wildfires were responsible for the smoke impacts seen in Sacramento County. The PM_{10} concentrations monitored outside of Sacramento County also showed that the smoke impact extended beyond Sacramento County in all directions. $PM_{2.5}$, carbon monoxide, black carbon and organic carbon concentrations, which are other indictors of wildfire smoke impacts, were also elevated at monitors in Sacramento County during the days when exceedances occurred. This analysis shows that wildfire smoke contributed to the PM_{10} exceedances in September 2020.

A.16 References

Burke, Molly and McGough, Michael. “Air Quality reaches hazardous levels in Sacramento. It’s not just from wildfires.” *Sacramento Bee.* 8 September 2020. Web. 30 April 2021. < https://www.sacbee.com/news/weather-news/article245564140.html >

Burke, Molly and McGough, Michael. “Sacramento air quality reaches ‘very unhealthy’ level but conditions could change Sunday”. *Sacramento Bee.* 11 September 2020. Web 30 April 2021. < https://www.sacbee.com/news/weather-news/article245660025.html >

Carlmak, Rob. Northern California braces for strong winds and high fire risk Tuesday, Wednesday. ABC10 News. 8 September 8, 2020

Carlmark, Rob. “Northern California braces for strong winds and high fire risk Tuesday, Wednesday” abc10. Web. 30 April 2021. < https://www.abc10.com/article/weather/northern-california-braces-for-strong-winds-and-a-high-fire-risk/103-4eac2e80-1be7-4104-bde2-02ff77412a93 >

Cal Fire, 2020. Cal Fire California Statewide Fire Summary for Friday Morning, September 11, 2020. Web < https://www.goldrushcam.com/sierrasuntimes/index.php/news/local-news/25317-cal-fire-california-statewide-fire-summary-for-friday-morning-september-11-2020 >

InciWeb, “Slater/Devil Fires Information - InciWeb the Incident Information System (nwcg.gov)” Web 30 April 2021a. < https://inciweb.nwcg.gov/incident/7173/ >

---. “Red Salmon Complex Information - InciWeb the Incident Information System (nwcg.gov)” Web 30 April 2021b. < https://inciweb.nwcg.gov/incident/6891/ >

---. "August Complex Information - InciWeb the Incident Information System (nwcg.gov)" Web 30 April 2021c. < https://inciweb.nwcg.gov/incident/6983/ >

---. "North Complex Information - InciWeb the Incident Information System (nwcg.gov)" Web 30 April 2021d. < https://inciweb.nwcg.gov/incident/6997/ >

---. "Creek Fire Information - InciWeb the Incident Information System (nwcg.gov)". Web 30 April 2021e. < https://inciweb.nwcg.gov/incident/7147/ >

---. "Creek Fire Information - InciWeb the Incident Information System (nwcg.gov)" Web 30 April 2021f. < https://inciweb.nwcg.gov/incident/7147/ >

National Weather Service, 2020. National Weather Service Area Forecast Discussion. Sacramento, CA. Forecast Discussions for September 8 through 13, 2020.

NOAA. "Air Resources Laboratory - HYSPLIT - Hybrid Single Particle Lagrangian Integrated Trajectory model (noaa.gov)". National Oceanic and Atmospheric Administration. Air Resource Laboratory. Web. 30 April 2021a. < https://www.ready.noaa.gov/HYSPLIT.php >

---. "Local Climatological Data (LCD) | Data Tools | Climate Data Online (CDO) | National Climatic Data Center (NCDC) (noaa.gov)" National Oceanic and Atmospheric Administration. National Weather Service. Web. 30 April 2021. < https://www.ncdc.noaa.gov/cdo-web/datatools/lcd >

Sac Metro Air District (AQMD). "Dry Conditions and wind gusts cause…" 9 September 2020, 4:50PM. Tweet.

---. "Smoke will continue to impact the Sacramento…" 12 September 2020, 9:04 AM. Tweet.

Sacramento County, et al. "Coarse Particles Episode Expected to Subside, but Wildfire Smoke Pollution Will Continue to Impact Region". Sacramento, CA: Sacramento County. 9 September 2020. Print.

USEPA. "Air Quality System (AQS) | US EPA". United States Environmental Protection Agency. Web. Various dates. < https://www.epa.gov/aqs >

---. *AirNow-Tech.* United States Environmental Protection Agency. Web 20 March 2020 < https://www.airnowtech.org/ >.

---. "Wildfire Smoke – A guide for Public Health Officials. Revised 2019." United States Environmental Protection Agency. August 2019. Web. 30 April 2021. < https://www.airnow.gov/sites/default/files/2020-10/wildfire-smoke-guide-revised-2019_0.pdf >

---. "Definitions." 40 CFR §50.1

Appendix B: Emissions Inventory

Emissions Inventories include the 2017 (base year), 2024 (beginning of the second maintenance period), 2027 (an interim year), and 2033 (the end of the maintenance period). Included are the anthropogenic emissions inventory of PM_{10} and Nitrogen Oxides (NO_X), by source categories for Sacramento County. The emissions inventory is shown in units of tons per day (tpd) for average winter day. Inventories were downloaded from the California Air Resources Board's (CARB's) California Emissions Projection Analysis Model (CEPAM) 2019: External Adjustment Reporting Tool - Version 1.02 accessed on April 1st, 2021.

< https://www.arb.ca.gov/app/emsinv/2019ozsip/fcmasterdetail_sip2019.php >

Three electronic spreadsheets are included in this

Appendix B-01 (available separately in electronic file format) contains summarized emissions inventories of PM_{10} and NO_X downloaded from CARB's CEPAM 2019: External Adjustment Reporting Tool - Version 1.02. It also includes the original tables and figures for the Tables 3-1 and 3-2, Figures 3-1, 3-2, and 3-3.

< Appendix B-01 CEPAM v1.02 with External Adjustment Factor and Background.xlsx > (link)

Appendix B-02 (available separately in electronic file format) contains estimated PM_{10} and NO_X stationary, area-wide and off-road forecast emission by EIC emission categories for the Sacramento Federal Nonattainment Area in CARB's CEPAM 2019: External Adjustment Reporting Tool - Version 1.02.

< Appendix B-02 Detailed Emissions Inventoy.xlsx > (link)

Appendix B-03

Appendix B-03 (available separately in electronic file format) contains the historical and projected population data downloaded from California Department of Finance. It also contains the historical and forecasted vehicle miles travelled (VMT) data obtained from Sacramento Area Council of Governments (SACOG) and the source data of Figure 3-4 Population and VMT Forecasts Sacramento County (2005-2040).

< Appendix B-03 Pop and VMT Projections 2021-08-26.xlsx > (link)

Appendix C: Control Measures

The Contingency Plan Section (Chapter 6) outlines when the District will look at implementation of new rules and/or modifications to existing rules. The following tables list the possible control measures to reduce PM_{10} emissions.

Table C-1 Possible Control Measures to reduce windblown dust

Source Category	**Possible Control Measures**
Paved Roads	Improved sanding/salting applications/materials
	Truck covering
	Construction site measures
	Curb installation and shoulder stabilization
	Storm water drainage
Unpaved Roads	Paving and surface improvements (graveling)
	Chemical stabilization
	Traffic reduction plans
	Vehicle speed reduction
Storage Piles (Transfer Operations)	Wet suppression and dust control
Construction/Demolition	Paving permanent roads early in project
	Truck covering
	Access apron construction and cleaning
	Watering of graveled travel surfaces
Open Area Wind Erosion	Revegetation
	Limitation of off-road vehicle traffic
	Limitation of leaf blowers
Agricultural Tilling	Land conservation practices

The following residential wood combustion control measures have been identified to reduce PM_{10} emissions.

Table C-2 Possible Control Measures for Wood Combustion

Source Category	**Possible Control Measures**
Integral Measures	Improved wood burning performance • Control of wood moisture content[1] • Weatherization of homes and wood stoves • Educational opacity program
Existing Installations	Convert wood-burning fireplaces to gas logs[2] Changeover to EPA-certified Phase II stoves or low emitting stoves[2]
New Installations	Gas fireplaces or gas logs in new installations[3] Upgrade offset Restriction on number or density of new stove and fireplace installations
New and Existing Installations	Device offset and Upgrade offset

Notes:

1 Rule 417 has only a requirement that sellers cannot advertise, describe, or in any way represent it to be "seasoned" or "dry" wood unless it has a moisture content of 20 percent or less by weight

2 Voluntary incentive program has been implemented

3 Rule 417 prohibits installation of a new wood burning fireplace, although EPA-certified wood stoves are allowed.